Washington Metropolitan Area Transit Authority

ANNUAL INTERNAL REVIEW 2017

Metrorail Track Inspections

QICO Internal Review

June 9, 2017

Quality Assurance, Internal Compliance & Oversight (QICO)

"Quality Trumps Quantity"

QICO Internal Review

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Internal Review Summary

Why QICO Performed This Review:

- This internal review is intended to provide Metro's senior management with an assessment of the state of Metrorail's track inspection program and promote the actions needed to address any concerns.

- QICO is independent from the functions it oversees and is authorized by the Metro General Manager to conduct objective reviews with unrestricted access to all functions, records, assets and employees under its purview.

QICO's Methodology:

- Develop relevant review activities by identifying and assessing risks to quality of work, compliance with standards, records management and safety.

- Review maintenance documentation, observe maintenance inspection work while in-progress, and interview key personnel.

- Review findings and required actions are rated based on severity of risk, which ranges on a scale from "Insignificant" to "High."

Note: An itemized Corrective Action Plan (CAP) is developed for each required action to achieve effective and measureable resolution of identified concerns. To check the status of CAP implementation, go to www.wmata.com/initiatives/transparency.

June 2017

Metrorail Track Inspections

QICO's Internal Review Results:

Ensuring Data Validity for the Track Inspection Defect Database is Key to Formulating Clear Strategies for Track Maintenance.

Metrorail's track inspection program consists of 47 track walking inspectors and an in-house, primarily night-operating Track Geometry Vehicle (TGV). QICO's internal review identified and noted several **Wins (What Worked Well)** and several **Areas for Improvement**:

- ✓ The TGV meets the testing frequency established in procedure.
- ✓ Cross-training for TGV personnel improves flexibility of operation.
- ✓ The six-week (in-class) track inspection course has improved.
- ✓ Additional time windows are available for track inspection activities.
- Identification of defects that result in speed restrictions prevent track inspectors from completing walks.
- Walking track inspection frequency needs re-evaluation.
- The track inspection group needs better special trackwork training.
- The defect database contains duplicate and unclosed records.
- Photographic evidence of rail defects is inconsistently captured.
- The linear asset visualization tool (Optram) is underutilized.
- In-office safety briefings add limited value to track inspections.
- Gauge rods noted during track inspection shadowing were not removed within the established 14-day window.
- Roadway access for track inspections depends on other operations throughout the system, without prioritization.
- TGV policies need to be updated.
- There is no requirement for engineering to comprehensively assess track inspection data.
- The TGV requires manual synchronization during TGV runs.
- The TGV gauge defects are reviewed manually.
- The Standard Operating Procedure (SOP) for implementing speed restrictions needs revision for clarity.

Required Actions:

- **QICO-TIP-17-01:** Implement updated training programs and improvements to inspection schedules and territories to enhance the effectiveness of inspection activities, emphasizing quality over quantity. *(Risk Rating: High)*
- **QICO-TIP-17-02:** Document and implement a strategy to improve and maintain the quality of the defect database so that it can be relied upon by maintenance decision-makers. *(Risk Rating: Elevated)*
- **QICO-TIP-17-03**: Establish a process to determine the precedence and priority of track access for essential inspection activities, reinforcing safety standards for field activities. *(Risk Rating: Elevated)*
- **QICO-TIP-17-04:** Establish and update processes to better utilize the potential of the TGV, outlining requirements for engineering review of data it produces. *(Risk Rating: Elevated)*

1 DEPARTMENT/FUNCTION OVERVIEW

Track Inspection and Track Geometry Vehicle (TGV)

Metrorail employs a multifaceted strategy involving both automated and manned track inspection methods to ensure the track integrity for over 234 miles of mainline track and eight yards. WMATA track inspections focus on detecting and categorizing defects in the roadway, including defects to the track structure, third rail assets and tunnel water ingression issues. Other assets which naturally reside in the track (e.g. switch machines, station platforms, aerial structures, etc.) are maintained by other groups (e.g. ATC maintenance, structures maintenance, etc.). Three primary forms of inspection provide maintenance leadership data to make decisions regarding preventative and corrective maintenance:

(1) Walking Track Inspections ("track walkers") – These inspections aim to inspect the entire Metrorail system on-foot twice weekly. For more information, see Appendix B: Walking Track Inspections.

(2) Track Geometry Vehicle (TGV) – a staffed inspection vehicle that precisely logs track geometry data for every linear foot of track. The entire Metrorail system is currently scanned twice yearly. This staffed inspection vehicle also ultrasonically tests (UT) the entire Metrorail system's running rail annually. For more information, see Appendix C: Track Geometry Vehicle (TGV).

(3) Other forms of inspection – a growing list of inspections currently provided by third party (ground penetrating radar, timber tie scanning) and other automated in-house sources of data (ride quality data). See Appendix D: Other Forms of Inspection.

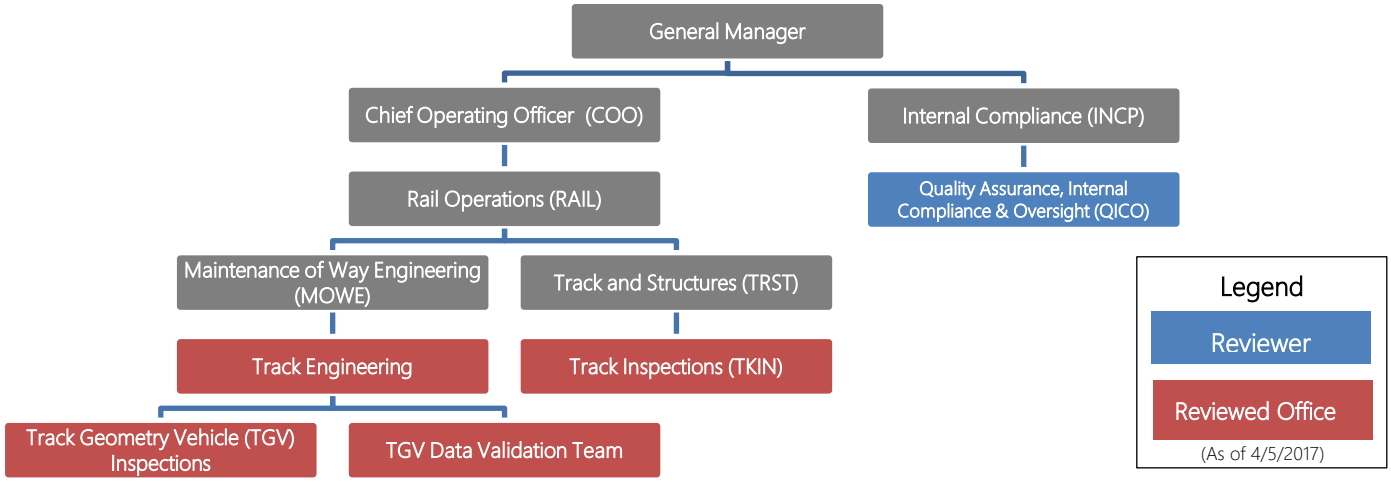
Administrative and operating procedures (covering scope and frequency) for walking track inspection are governed by the WMATA-1000 and WMATA-2000 for Track and Structures. Track Geometry Vehicle operation and maintenance is governed by SOP/OAP 114-01, Track Geometry Vehicle Policy and Procedure.

2 REVIEW METHODOLOGY

Review Stakeholders

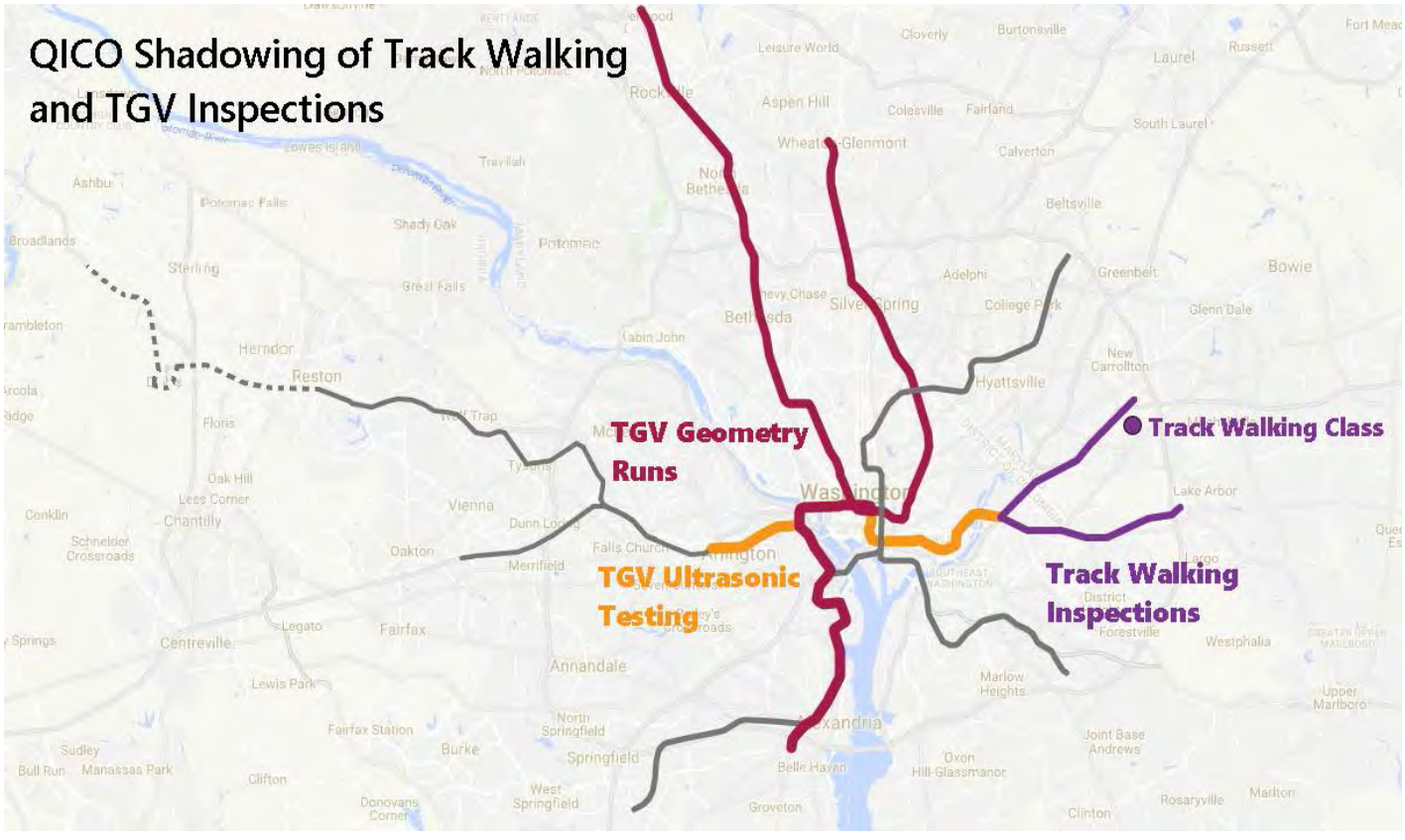
The Infrastructure Assurance branch of the Office of Quality, Internal Compliance and Oversight (QICO) conducted an internal review of the track walking inspection group, which resides within the Office of Track and Structures (TRST), and the TGV team and supporting operations, which reports to Maintenance of Way Engineering (MOWE). As shown in the org chart, QICO is entirely independent of these groups. QICO performed the review from February 2 – March 31, 2017.

QICO reviewed documentation, interviewed personnel, and shadowed field visits for both TGV and track-walking personnel, noting both positive findings and negative findings. QICO's findings are categorized into four groups: Quality of Work, Compliance with Standards, Records Management and Safety. For each finding there is an associated Recommendation (a suggestion for improving a process based upon QICO's systematic review). Findings are combined into several Required Actions, which summarize the steps actions owners must take to address deficiencies.



2.1 REVIEW SCOPE

Category	Description
Review of Existing Documentation (Appendix G)	- Governing Maintenance Documentation: WMATA-1000/WMATA-2000 - Governing TGV Documentation: SOP/OAP 114-01 (Track Geometry Vehicle Operating Policy and Procedure) - Inspection Records from Track Inspector Shared Drive - Review of Inspection Records in Optram - Previous recommendations from WMATA Oversight: Federal Transit Administration (FTA) Corrective Action Plans (CAPS) and recommendations from the National Transportation Safety Board (NTSB)
Interviews of Key Personnel (Appendix H)	- Track Geometry Vehicle (TGV) Manager and Assistant Chief Engineer for Track Engineering - TGV Data Validation Team (Track Engineering and TRST) and WMATA's Optram Consultant - Division Superintendent, New Carrolton (Overseeing Track Inspection)
Shadowing Field Inspections and Business Processes (Appendix J)	- TGV Ride-Along (Track Geometry) - TGV Ride-Along (Ultrasonic Testing) - Track Inspections (Mainline) - Track Inspections (Special Trackwork and Yards) - Track Walking Inspection Class



2.2 REVIEW CRITERIA

Quality Measures		Definition
Quality of Work	Workmanship	Qualitative or quantitative measurement of material characteristics of work performed.
	Performance of Work	Qualitative or quantitative measurement of actions taken to complete work.
	Housekeeping	Assessment of site conditions; i.e. work zone organization and clenliness.
	Quality Control Measures	Internal management controls that ensure the consistency and reliablilty of work performed.
	Materials and Tooling	Measureable properties of parts and tools used to perform work.
Records Management	Work Order Management	Protocols established to control maintenance scheduling, documentation, and tracking.
	Processes	Documented requirements for departmental activites.
	Records Storage and Retention	Documented requirements for the maintenance of records and documentation.
Safety	Roadway Worker Protection (RWP)	Documented requirements for work zone setup and personal protective equipment.
	Applicable Job Safety Requirements	Any documented safety requirements that apply to specific work performed.
Compliance with Standards	Technical Specifications	Engineering requirements that outline the minimum requirements for material and workmanship standards.
	Business Practices	Formal documented standards governing business practices; i.e. P/I's, departmental policies, etc.
	Procedural Requirements	Formal documented standards that identify specific actions to be taken; i.e. who, what, when, where, how?
	Regulatory Findings	Findings issued by outside regulatory entities (FTA, NTSB, GAO) that generate recommendations or required actions.
	Internal Findings	Findings issued by internal oversight entities (OIG, QICO, SAFE) that generate recommendations or required actions.

2.3 RISK ASSESSMENT SUMMARY

Note: Findings and required actions are rated based on severity of risk. Refer to Appendix A (Risk Assessment) for details.

Definitions

Insignificant	Low	Moderate	Elevated	High
Reasonable assumption that this risk will not occur and unlikely to cause the activity to fail to meet part of its objective	Reasonable assumption that this risk will likely not occur & may cause a failure of the business process to meet part of its objectives	Reasonable assumption that this risk may occur & may cause a failure of the business process to meet a significant part of its objectives	Reasonable assumption that this risk will likely occur & likely to cause a failure of the business process to meet a significant part of its objectives	Reasonable assumption that this will occur & will cause a failure of the business process to meet its objectives or cause objective failure in other activities

3 WHAT WORKED WELL?

Measure	Finding	Description
Compliance with Standards	Track Geometry Vehicle (TGV) has met or exceeded its testing frequency set forth by OAP/SOP 114-01.	- The Track Geometry Vehicle (TGV) is required to perform geometry testing on all mainline track biannually and yard track annually. In addition, UT testing is required annually, during which track geometry is concurrently tested (but not uploaded into Optram). The last three system-wide track geometry tests were conducted February 2016, September 2016 and March 2017; UT tests were being conducted during the review period (March 2017). The TGV has priority at rail scheduling meetings for night-time track work. Note that these inspection frequencies are more stringent than Federal Railroad Administration (FRA) standards for automated inspection for the comparable passenger track class. *(Source: Interview of TGV Manager, review of SOP/OAP 114-01, review of 49 CFR 213.333 - Automated vehicle-based inspection systems)*
Compliance with Standards	Proactive measures are being undertaken by TGV leadership to ensure cross-training for personnel.	- As it is currently structured, the TGV is a leaner operation than originally envisioned (in 2012). In order to maximize flexibility, the TGV leadership has scheduled for staff to be cross-trained in each other's roles (Appendix C). This will allow for testing during revenue hours (track geometry, and ultrasonic scanning). Another on-board TGV tech is to be hired for contingency planning. *(Source: App H: Interview of TGV Manager)*
Quality of Work	The new six-week (in class) track inspection course has improved breadth, depth, and approach.	- As a result of walking track inspection reorganization and retraining, a new track walking inspection course is being taught at WMATA's Carmen Turner Facility (CTF). QICO's two track engineering representatives shadowed the class. The class provides both a thorough review of the WMATA-1000 (TRST) and hands-on outdoor instruction. Instructors (K&J Consultants) were open to questions throughout any portion of the class and were very knowledgeable. - In attendance were representatives from Technical Skills Maintenance Training (TSMT), who will teach the class once proficient in the source material. The Division Superintendent for New Carrollton was actively noting contradictions in the current WMATA-1000, with the intention of relaying his concerns to the Chief of Track Engineering for the upcoming revision (Rev 7, 2017). *(Source: App J: QICO shadowing Track Walking Class, March 28-29)*
Safety	Additional time windows (evenings, nights) are being utilized for track walking in areas of low headways (tunnelled core sections) and areas requiring additional safety protections.	- Tracks that lack adequate protection for safe usage of Train Approach Warning (typical roadway protection utilized by walking track inspectors) are inspected at night. This includes track E2 along the Greenbelt Test Track (no clearance) and track in the vicinity of National Airport (no clearance). - Underground tracks in the Metrorail core (red line and tunnel servicing orange/blue/silver) are being inspected during evenings (8-1130) in order to avoid placing too many groups in the roadway during mid-day non-peak hours (10-2pm). *(Source: App H: Interview with Shady Grove Division Superintendent, App J: QICO shadowing walking track inspections)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on risk on a 1 (Insignificant) to 5 (High) scale. Refer to Appendix A (Risk Assessment) for further details

Measure	Finding	Description
Quality of Work	F-TIP-17-01: The TGV requires manual dead-reckoning (periodically syncing the vehicle at chainmarkers). *Technological Risk* Low (2.4)	- A successful TGV run relies upon accurate position data while underground. Dead-reckoning implies distance travelled from the revolutions of the wheels by calculating its position using a previously known position and its estimated speed. Error is introduced over time primarily through equation changes, wheel wear and general slippage throughout the run. Therefore, a dedicated member of the on-board team is required to manually sync the TGV with chainmarkers periodically during the run. **Recommendation:** Investigate automated solutions to improve vehicle syncing for dead-reckoning. *(Source: App J: TGV Ride-Along)*
Quality of Work	F-TIP-17-02: Track inspectors do not finish their walks when defects are identified that result in speed restrictions. The system averages 1-2 track speed restrictions per day. *Governance Risk* Moderate (3.3)	- In the two (2) days QICO shadowed track inspection, neither mainline walk was completed due to the discovery of severe defects. Allowing inspectors to properly describe the defect and its location to Maintenance Operations Control (MOC), mark the defect for removal, and continue their inspection would reduce the number of incomplete track inspections (which requires inspectors to complete a non-compliance form). - In the past year (January 2016-2017), over 500 speed restrictions have been implemented on the Metrorail system. Many of these were instituted by track walkers for fastening-system defects (100+) and timber tie defects on ballasted track (100+). Many of these incidents have a progressively worsening defect history over time. **Recommendation:** Establish formal practices for completing track inspections, taking into account the need for correction of defects resulting in speed restrictions. *(Source: App J: QICO shadowing walking track inspections)*
Quality of Work	F-TIP-17-03: The track inspection force lacks specialized training for special trackwork components. *Operational Risk* High (4.5)	- Track inspectors conduct monthly turnout inspections and inspect portions of turnouts on daily track inspections. Track inspectors of various seniority levels at the new track walking inspection class at Carmen Turner Facility (CTF) demonstrated a lack of familiarity with certain special trackwork component names or where to perform measurements. Switch inspection forms for the regions have been properly filled out and switch inspections have been timely. Recommendation: Complete training for the entire track inspection force on the updated curriculum to improve inspection of special trackwork. *(Source: App J: Shadowing Track Walking Class, 3/29)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on risk on a 1 (Insignificant) to 5 (High) scale. Refer to Appendix A (Risk Assessment) for further details

Measure	Finding	Description
Quality of Work	F-TIP-17-04: Half of *mainline* track inspections examined by QICO did not find any new defects from previous inspections. *Governance Risk* Elevated (3,5)	- QICO reviewed daily track walking records for three areas (Dulles, Alexandria, Branch Avenue/College Park) for February 2017. Half of all track inspections do not discover any new defects. - This statement is not indicative of the quality of work performed, as after saturating the track walking database, new defects *should not be found* on a daily basis. However, it calls into question the frequencies Metrorail requires its track walkers to inspect track. Why are the crossover sections of special trackwork required to be inspected monthly but mainline track eight times per month? **Recommendation:** Evaluate improvements to track inspection schedules and territories to reduce the areas covered in a single shift, emphasizing quality of inspection and reporting over quantity of inspections. *(Source: review of February 2017 daily track inspections)*
Quality of Work	F-TIP-17-05: Gauge rods noted during the internal review were not removed during the required 14-day window. *Governance Risk* Moderate (3,4)	- Gauge rods are frequently installed during speed restrictions implemented by track walkers. These are temporary fixes that must be removed in 14-days according to TRST Maintenance Bulletin 20160929-05, "Gauge Rod Installation." Gauge rods require special attention because they de-escalate black conditions to yellow conditions in Maximo without remediating the underlying problem. - Gauge rods were installed during QICO's shadowing of field inspectors (3/17/2/2017). These gauge rods have not been removed in the required 14-day window. No work in the area has been shown as approved, in-progress, or completed; however, it should be noted the area in question is the focus of an upcoming SafeTrack Surge (Surge 15, Minnesota Ave to New Carrollton). (See Typical Gauge-Rod Defect in *Optram Data*) **Recommendation:** Formalize the gauge rod installation/removal process within a governing document (i.e. WMATA-1000, 2000, etc.), to include methods for escalation of defect rating if the established timeframe for correction is exceeded. *(Source: Maximo, App J: Shadowing Track Walking Inspections)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on risk on a 1 (Insignificant) to 5 (High) scale. Refer to Appendix A (Risk Assessment) for further details

Measure	Finding	Description
Records Management	F-TIP-17-06: The track walking inspection database, as displayed in Optram, contains a series of duplicate, orphaned, and open work orders, with mis-categorized defect codes. *Operational Risk* Elevated (4.4)	- QICO accessed the track walking defect database (corrective maintenance work orders in Maximo with inspector-classified defect codes) on 3/29/2017 to observe track walking defects between D98 Junction and Cheverly Station (Appendix F) for the past 3 years (2014-2017); this was chosen to avoid areas that have already been targeted by SafeTrack for maintenance. - These defects are only displayed if they are not closed (e.g. WAPPR state). QICO found many instances of duplicates (defects that have been re-entered into Maximo at a later date), double classification (duplicates that go undetected because they have different component/defect codes), unclosed work orders that blanket a wide area, and gauge rods listed as green conditions (Appendix F). **Recommendation:** Develop methods to improve the quality of defect records contained in the enterprise asset management database (Maximo), clearly defining the use of component and defect codes to be used for track inspection purposes. *(Source: App F: Optram Review, App J: Shadowing Field Inspections)*
Records Management	F-TIP-17-07: Photographic evidence of red and black defects identified during inspections is inconsistently captured in the enterprise asset management database (Maximo). *Technological Risk* Elevated (3.5)	- One major goal of walking track inspections is to comprehensively reflect the state of the Metrorail system through a frequently-updated defect database. Attaching photos to the defects improves the overall value of the database as a condition assessment. This practice, while sometimes adhered to (e.g. Maximo WO 13324404 and its attachment), is not consistently applied. **Recommendation:** Establish written requirements for the capture and storage of photographs when red and black conditions are discovered during walking track inspections. *(Source: Review of Optram Data)*
Records Management	F-TIP-17-08: The track walking inspection database visualization tool (Optram) is underutilized, with an unclear role as part of WMATA's asset management strategy. *Technological Risk* Moderate (3.4)	- Optram is a powerful linear asset management and maintenance tool that produces a user interface to view TGV data and track walking defects (collected in Maximo) side-by-side with other data overlays. It is underutilized by walking track inspection (track supervisors and below) as well as other departments (ATC Maintenance, Traction Power, etc). - Optram utilization has been road blocked by easily-correctable IT issues, including its unpublicized availability from WMATA's intranet, slow performance, and delays to upgrading to the next version. **Recommendation:** Improve the utilization of the linear visualization tool (Optram) through the implementation of training on the capabilities and proper use of the system. *(Source: App H: Discussion with Division Superintendent, Interview of TGV Data Validation Team, Optram Review)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on risk on a 1 (Insignificant) to 5 (High) scale. Refer to Appendix A (Risk Assessment) for further details

Measure	Finding	Description
Safety	F-TIP-17-9 (See Section 5: Other Observations)	
Safety	F-TIP-17-10: Roadway access for walking track inspections is dependent on other rail operations throughout the system, where priorities may conflict. *Operational Risk* Elevated (3.5)	- QICO noted during its shadowing of track inspectors that accessing the roadway has become difficult due to a limit imposed by ROCC for the number of work groups allowed on the roadway. This has resulted in a waitlist to access the track, with wait times up to an hour. One reason this limit was implemented was adherence to Permanent Order T-16-07 (trains slow to 10 mph around wayside personnel) by communicating all inspector/maintenance group position to train operators; having more groups on the roadway makes communication cumbersome and systematically slows Metrorail operation. - Beyond moving some inspections to evening revenue periods (process already implemented for some tracks), track inspections should be prioritized for mid-day track access. Related to this issue is NTSB R-8-004-A, which requires the Authority to investigate technologies that alert wayside employees of approaching trains. The technologies as described in a November board meeting would not apply to track inspectors. **Recommendation:** Develop a process to determine which groups receive precedence or priority for track access maximize time available to complete critical inspection activities.
Compliance with Standards	F-TIP-17-11: The Operations Administration Policy (OAP) does not reflect where TGV data is stored, and the Standard Operating Procedure (SOP) does not pinpoint the location of calibration rails. *Governance Risk* Low (2.4)	- *"Data, Exception and Defect Reports generated must be saved and forwarded to the TGV Data Analyst of Track, Structures and Facilities Engineering (TSFA) [MOWE: Track Engineering] and the TGV Superintendent." (OAP 114-01)* - The calibration rails are used for testing on-board ultrasonic equipment. The attachments would be suited better the SOP if the calibration rails identified which track is the test track and the yard layout highlighted the location of the test area. **Recommendation:** Update TGV policies and procedures to include specific requirements for the storage of data collected and the location of calibration rails on the yard maps. *(Source: App G: Review of OAP/SOP)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on risk on a 1 (Insignificant) to 5 (High) scale. Refer to Appendix A (Risk Assessment) for further details

Measure	Finding	Description
Compliance with Standards	F-TIP-17-12: There is no requirement for an engineering assessment of track inspection data. *Operational Risk* Elevated (4,4)	- The TGV produces a large amount of data for every system-wide scan; in addition, there are increasing amounts of useful track data from other sources (ride quality, tie scanning, etc.). Track Engineering (MOWE) provides a list of wide-gauge areas to maintenance leadership, and utilizes TGV data in incident investigation. No group is required to provide a detailed engineering analysis to aggregate findings from the various sources of data. This represents an underutilization of the TGV, which is on the order of a 13.5 million dollar program (CIP0065). **Recommendation:** Establish written requirements for periodic assessments of track inspection data by Track Engineering (MOWE), incorporating a combination of track inspection reports, field inspection, and historical data.
Compliance with Standards	F-TIP-17-13: The TGV gauge defects are reviewed manually. *Technological Risk* Moderate (3,4)	- For each TGV run, gauge exceptions (e.g. wide gauge) must be manually checked by the TGV data analyst. The process typically take 2-3 days. The FRA is moving towards a 24-hour turnaround for verifying and uploading automated inspection data. Utilizing post-run computer programming (scripts) to automatically validate the data could help accelerate this process, and ensure that red or black TGV defects listed in Optram are not false positives. **Recommendation:** Develop methods for post-run scripts that can process and validate the data to reduce the amount of manual data entry required. *(Source: 49 CFR 213.333 - Automated vehicle-based inspection systems)*
Compliance with Standards	F-TIP-17-14: The ambiguity of MSRPH SOP #30 (Speed Restrictions) allows for different interpretations of the boundaries to be communicated by wayside personnel (inspectors) to Rail Operations Control Center (ROCC) and Maintenance Operations Center (MOC). *Governance Risk* Low (2,4)	- During the review, a track inspector provided OCC/MOC with 600 feet added to either side of his defective area for a speed restriction; this risks ROCC/MOC adding an extra unnecessary footage to the final speed restriction. A joint meeting between QICO, representatives from ROCC, and Track and Structures (TRST) established that the Metrorail Safety Rules and Procedures Handbook (MSRPH) Standard Operating Procedure (SOP) #30 (Speed Restriction for the Mainline) does not clearly delineate the difference between a defective area and speed restriction boundaries, and does not clearly delineate responsibilities for communicating these boundaries. **Recommendation:** Clearly define within SOP #30 of the Metrorail Safety Rules and Procedures Handbook the roles of the wayside personnel and ROCC/MOC controllers with regards to communicating speed restriction boundaries around a defective area. *(Source: App J: Shadowing Daily Track Inspection)*

5 OTHER OBSERVATIONS

Measure	Finding	Description
Safety	F-TIP-17-9: The in-office safety briefing, held by track inspection supervisors, adds limited value to track inspections.	- For both days QICO shadowed walking track inspections, a safety briefing was held in the office by the inspection supervisor, and then another safety briefing was conducted by the Roadway Worker In-Charge (RWIC) on-site. Safety is a top priority; however, the in-office safety briefing appears to have limited value, as the briefing does not address any track related safety issues.

6 SUMMARY OF REQUIRED ACTIONS

Note: Required actions are rated based on risk on a 1 (Insignificant) to 5 (High) scale. Refer to Appendix A (Risk Assessment) for further details.

Required Action	Finding		Owner
QICO-TIP-17-01 Implement updated training programs and improvements to inspection schedules and territories to enhance the effectiveness of inspection activities, emphasizing quality over quantity. 5/High	F-TIP-17-01	The TGV requires manual dead-reckoning (periodically syncing the vehicle at chainmarkers).	MOWE
	F-TIP-17-02	Track inspectors do not finish their walks when defects are identified that result in speed restrictions. The system averages 1-2 track speed restrictions per day.	TRST
	F-TIP-17-03	The track inspection force lacks specialized training for special trackwork components.	TRST, OPMS
	F-TIP-17-04	Half of *mainline* track inspections examined by QICO did not find any new defects from previous inspections.	TRST
	F-TIP-17-05	Gauge rods noted during the internal review were not removed in the required 14-day window.	TRST
QICO-TIP-17-02 Document and implement a strategy improve and maintain the quality of the defect database so that it can be relied upon by maintenance decision-makers. 4/Elevated	F-TIP-17-06	The track walking inspection database, as displayed in Optram, contains a series of duplicate, orphaned, and open work orders, with mis-categorized defect codes.	TRST
	F-TIP-17-07	Photographic evidence of red and black defects identified during inspections is inconsistently captured in the enterprise asset management database (Maximo).	TRST
	F-TIP-17-08	The track walking inspection database visualization tool (Optram) is underutilized, with an unclear role as part of WMATA's asset management strategy.	MOWE, TRST, IT
QICO-TIP-17-03 Establish a process to determine the precedence and priority of track access for essential inspection activities, reinforcing	F-TIP-17-09	*(Downgraded. See Section 5: Other Observations)*	*
	F-TIP-17-10	Roadway access for walking track inspections is dependent on other rail operations throughout the system, where priorities may conflict.	RTRA
	F-TIP-17-14	The ambiguity of MSRPH SOP #30 (Speed Restrictions) allows for different interpretations of the boundaries to be communicated by	TRST

6 SUMMARY OF REQUIRED ACTIONS

Note: Required actions are rated based on risk on a 1 (Insignificant) to 5 (High) scale. Refer to Appendix A (Risk Assessment) for further details.

Required Action	Finding		Owner
safety standards for field activities. 4/Elevated		wayside personnel (inspectors) to Rail Operations Control Center (ROCC) and Maintenance Operations Center (MOC).	
QICO-TIP-17-04 Establish and update processes to better utilize the potential of the TGV, outlining requirements for engineering review of data it produces. 4/Elevated	F-TIP-17-11	The Operations Administration Policy (OAP) does not reflect where TGV data is stored, and the Standard Operating Procedure (SOP) does not pinpoint the location of calibration rails.	MOWE
	F-TIP-17-12	There is no requirement for an engineering assessment of track inspection data.	MOWE
	F-TIP-17-13	The TGV gauge defects are reviewed manually.	MOWE

7 CORRECTIVE ACTION PLANS

INTERNAL REVIEW

Metro's Track Walking & Track Geometry Vehicle Inspections

In response to the internal review report for Metro's Track Walking & Track Geometry Vehicle Inspections dated April 10, 2017 QICO has coordinated with Operations and Engineering departments to develop four comprehensive CAPs. Each CAP outlines the findings, requirements and recommendations addressed, and a detailed action plan outlining responsible parties and specific actionable items.

EXECUTIVE LEADERSHIP OF RESPONSIBLE PARTIES

Corrective Action Plan (CAP) Commitment

[redacted] 6/7/17

Joseph Leader — Date

Chief Operating Officer (COO)

WMATA INTERNAL OVERSIGHT

Corrective Action Plan (CAP) Acknowledgement

[redacted] 06/07/17

Angel Peña — Date

Managing Director, Quality Assurance, Internal Compliance & Oversight (QICO)

[redacted] 6/8/17

Eric Christensen — Date

Chief, Internal Compliance (INCP)

[redacted] 6/9/17

Paul J. Wiedefeld — Date

General Manager & Chief Executive Officer (GM/CEO)

CORRECTIVE ACTION PLAN

Purpose and Scope

On April 10, 2017 QICO issued a comprehensive report from an internal review into Metro's track inspection program. This Corrective Action Plan (CAP) has been developed to address the following findings and required action per **QICO-TIP-17-01**.

QICO Finding	QICO Recommendation
F-TIP-17-01: The TGV requires manual dead-reckoning (periodically syncing the vehicle at chain markers).	- Investigate automated solutions to improve vehicle syncing for dead-reckoning.
F-TIP-17-02: Track inspectors do not finish their walks when defects are identified that result in speed restrictions. The system averages 1-2 track speed restrictions per day.	- Establish formal practices for completing track inspections, taking into account the need for correction of defects resulting in speed restrictions.
F-TIP-17-03: The track inspection force lacks specialized training for special trackwork components.	- Complete training for the entire track inspection force on the updated curriculum to improve inspection of special trackwork.
F-TIP-17-04: Half of mainline track inspections examined by QICO did not find any new defects from previous inspections.	- Evaluate improvements to track inspection schedules and territories to reduce the areas covered in a single shift, emphasizing quality of inspection and reporting over quantity (frequency) of inspections.
F-TIP-17-05: Gauge rods are not being removed during the 14-day window.	- Formalize the gauge rod installation/removal process within a governing document (i.e. WMATA-1000, 2000, etc.), to include methods for escalation of defect rating if the established timeframe for correction is exceeded.

Required Action

QICO-TIP-17-01: Implement updated training programs and improvements to inspection schedules and territories to enhance the effectiveness of inspection activities, emphasizing quality over quantity.

(Risk Rating: High)

Plan Description

F-TIP-17-01: MOWE will continue explorative research on technologies such as RFID Tags and other technologies. Bi-annual updates on a selection of technology will be provided to QICO.

F-TIP-17-02: Track and Structures has instructed Track Walkers to continue their walks once a speed restriction is put in place (based on the level of the restriction). These instructions will be formalized in an SOP.

F-TIP-17-03: The Track Inspection training program has been revised to include all courses required to effectively train Track Walkers and their Supervisors, refresher/recertification training, as well as "Train-the-Trainer" program, evaluation and certification of WMATA Instructors. The revised training program is modular based with both classroom and field testing at each module (Please Reference FTA-16-4-T1)

F-TIP-17-04: Track and Structures will provide a proposed schedule and locations to reduce the areas covered in a single shift.

F-TIP-17-05: Track and Structures has documented in a Maintenance Bulletin the action that must take place when a gauge rod cannot be removed in a 14-day period.

Business Impact – Budget/Cost Estimate

- **Process Execution** – A current process/procedure exists that meets the QICO Required Action. This initiative does not need additional resources.

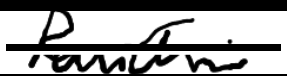
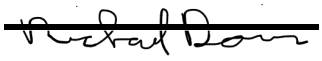
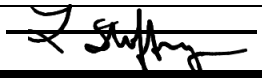
PLAN SCHEDULE					
Actionable Items		Description	Responsible Party*	Estimated Start	Estimated Completion
1	Alternative Technology Research	Maintenance-of-Way Engineering (MOWE) will provide semi-annual updates for ongoing research and selection of alternative technologies, such as RFID tags.	Ravi Amin (MOWE)	05/10/17	06/28/18
2	Track Walkers	Track and Structures will complete revision of SOP 208-12 (Implementation/Removal/Upgrade Speed Restriction) to include direction for Track Walkers to complete walking inspections based on the level of speed restriction.	Michael Davis (TRST)	05/10/17	06/30/17
3	Track Inspection Training Program	Training modules and associated classroom/field testing for the Track Walker Training Program will be coordinated with efforts underway as part of FTA-16-4-T1.	Linda Stoffregen (OPMS)	08/01/17	11/17/17
4	Maintenance Bulletin – Gauge Rod Installation	Track and Structures maintenance bulletin to reinforce requirements to ensure that gauge rods are temporary and are removed no later than 14 days from installation.	Michael Davis (TRST)	05/10/17	06/30/17
5	Gauge Rod Tracking	Maintenance logs indicating the date of installation and removal of gauge rods.	Michael Davis (TRST)	06/30/17	06/28/18
6	QICO CAP Verification Report	QICO will evaluate actionable items submitted to confirm there is reasonable evidence that the findings and this required action have been resolved, taking into account the actionable item descriptions and performance measures.	QICO	06/28/18	08/31/18

**In the event of personnel or departmental changes, responsibilities for actionable items shall transfer to the new leadership.*

COMPLETION DOCUMENTATION

Performance Measures

- 100% of Track Walkers receive training on updated speed restriction procedures.
- 90% of gauge rods removed within the 14-day window based on tracking reports.

RESPONSIBLE PARTIES		
MOWE	Ravi Amin	
TRST	Michael Davis	
OPMS	Linda Stoffregen	

SECOND LEVEL RESPONSIBILITY		
AGM RAIL	Andrew Off	

CORRECTIVE ACTION PLAN

Purpose and Scope

On April 10, 2017 QICO issued a comprehensive report from an internal review into Metro's track inspection program. This Corrective Action Plan (CAP) has been developed to address the following findings and required action per QICO-TIP-17-02.

QICO Finding	QICO Recommendation
F-TIP-17-06: The track walking inspection database, as displayed in Optram, contains a series of duplicate, orphaned, and open work orders, with mis-categorized defect codes.	- Develop methods to improve the quality of defect records contained in the enterprise asset management database (Maximo), clearly defining the use of component and defect codes to be used for track inspection purposes
F-TIP-17-07: Photographic evidence of red and black defects identified during inspections is inconsistently captured in the enterprise asset management database (Maximo).	- Establish written requirements for capturing and storing photographs when red and black conditions are discovered during walking track inspections.
F-TIP-17-08: The track walking inspection database visualization tool (Optram) is underutilized, with an unclear role as part of WMATA's asset management strategy.	- Improve the utilization of the linear visualization tool (Optram) through the implementation of training on the capabilities and proper use of the system.

Required Action

QICO-TIP-17-02: Document and implement a strategy to improve and maintain the quality of the defect database so that it can be relied upon by maintenance decision-makers.

(Risk Rating: Elevated)

Plan Description

F-TIP-17-06: TRST will continue developing a Maximo team to improve the quality of defects records in the enterprise asset management database (Maximo),

F-TIP-17-07: Track Walkers currently are not required to take photographic evidence of red and black defects because they are not issued cameras nor work phones to captures pictures. TRST is examining options to provide the necessary tools to Track Walkers so they may be able to capture photographic evidence of defects.

F-TIP-17-08: MOWE to revise process of capturing track assessment info in Optram. MOWE's consultant will provide regular training for all track related departments including TRST staff. Retraining will also be provided for TRST staff who have been already trained.

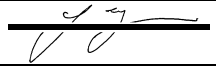
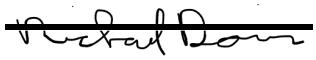
Business Impact – Budget/Cost Estimate

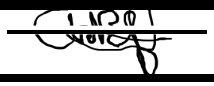
- **Process Execution** – A current process/procedure exists that meets the QICO Required Action, This initiative does not need additional resources.

PLAN SCHEDULE					
Actionable items		Description	Responsible Party*	Estimated Start	Estimated Completion
1	TRST Maximo Team Update	Track and Structures (TRST) will provide quarterly updates of process improvements and work flow charts to improve the quality of defects recorded in Maximo.	Michael Davis (TRST)	05/10/17	12/28/17
2	Maximo Data Business Plan	Maintenance-of-Way Engineering (MOWE) will establish a track assessment business plan and flow chart to direct collection, analysis, and storage of data, including staff responsibilities for MOWE and TRST.	Laura Mason (MOWE)	05/10/17	06/30/17
3	Optram Training	Curriculum and schedule for the Optram, including sign-in sheets for staff who have completed the training.	Ravi Amin (MOWE)	05/10/17	09/28/17
4	QICO CAP Verification Report	QICO will evaluate actionable items submitted to confirm there is reasonable evidence that the findings and this required action have been resolved, taking into account the actionable item descriptions and performance measures.	QICO	12/29/17	01/29/18

**In the event of personnel or departmental changes, responsibilities for actionable items shall transfer to the new leadership.*

COMPLETION DOCUMENTATION
Performance Measures
- 100% of TRST Supervisors complete Optram training.

RESPONSIBLE PARTIES		
MOWE	Ravi Amin	
MOWE	Laura Mason	
TRST	Michael Davis	

SECOND LEVEL RESPONSIBILITY		
AGM RAIL	Andrew Off	

CORRECTIVE ACTION PLAN

Purpose and Scope

On April 10, 2017 QICO issued a comprehensive report from an internal review into Metro's track inspection program. This Corrective Action Plan (CAP) has been developed to address the following findings and required action per **QICO-TIP-17-03**.

QICO Finding	QICO Recommendation
F-TIP-17-10: Roadway access for walking track inspections is dependent on other rail operations throughout the system, where priorities may conflict.	- Develop a process to determine which groups receive precedence or priority for track access to maximize time available to complete critical inspection activities.
F-TIP-17-14: The ambiguity of the language in the SOP #30, "Speed Restriction for the Mainline" allows for different interpretations of the boundaries to be communicated by wayside personnel (inspectors) to Rail Operations Control Center (ROCC) and Maintenance Operations Center (MOC).	- Clearly define within SOP #30 of the Metrorail Safety Rules and Procedures Handbook the roles of wayside personnel reporting speed-restrictable conditions (inspectors) and ROCC/MOC controllers with regards to communicating speed restriction boundaries around a defective area.

Required Action

QICO-TIP-17-03: Establish a process to determine the precedence and priority of track access for essential inspection activities, reinforcing safety standards for field activities.

(Risk Rating: Elevated)

Plan Description

F-TIP-17-10: Given the complex challenges of working on an operating railroad and numerous issues that can disrupt planned work, the key metrics tracked with respect to PMI and inspections are the completed percentage of work (measured monthly) and the quality of those inspections. MOWE will establish a weekly meeting to review incidents, trends and MOWE initiatives. Once a month, this meeting will review the PMI and inspection percentage completed and determine if any group needs additional resources or prioritization for ROW to complete inspections. This prioritization will also include assessment of planned capital and preventive maintenance work.

F-TIP-17-14: SOP # 30 will be revised to clearly define the roles of the Track Walkers and ROCC controllers when notifying ROCC of a condition on the roadway that will lead to a speed restriction.

Business Impact – Budget/Cost Estimate

- **Process Execution** – A current process/procedure exists that meets the QICO Required Action, This initiative does not need additional resources.

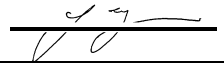
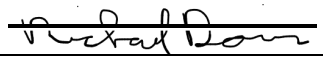
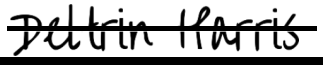
PLAN SCHEDULE					
Actionable items		Description	Responsible Party*	Estimated Start	Estimated Completion
1	Update SOP #30	Clearly define within SOP #30 of the Metrorail Safety Rules and Procedures Handbook the roles of the wayside personnel and ROCC/MOC controllers with regards to communicating speed restriction boundaries around a defective area.	Deltrin Harris (ROCC)	05/10/17	09/28/17
2	Roadway Access – PMI Monthly Meeting Minutes	Monthly meetings will include a review of ongoing track inspection and Preventative Maintenance Inspection (PMI) activities to determine the needs of maintenance and inspection groups and establish prioritization for ROW access.	Laura Mason (MOWE)	07/27/17	10/30/17
3	QICO CAP Verification Report	QICO will evaluate actionable items submitted to confirm there is reasonable evidence that the findings and this required action have been resolved, taking into account the actionable item descriptions and performance measures.	QICO	10/30/17	12/13/17

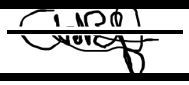
**In the event of personnel or departmental changes, responsibilities for actionable items shall transfer to the new leadership.*

COMPLETION DOCUMENTATION

Performance Measures

- 90% of track inspectors and controllers trained on SOP #30 once updated
- ROCC tracking for track access requests indicates number of approved vs. denied requests.

RESPONSIBLE PARTIES		
MOWE	Laura Mason	
TRST	Michael Davis	
ROCC	Deltrin Harris	

SECOND LEVEL RESPONSIBILITY		
AGM RAIL	Andrew Off	

CORRECTIVE ACTION PLAN

Purpose and Scope

On April 10, 2017 QICO issued a comprehensive internal review into Metro's Track Walking & Track Geometry Vehicle (TGV) Inspections. This Corrective Action Plan (CAP) has been developed to address the following findings and required action per **QICO-TIP-17-04**.

QICO Finding	QICO Recommendation
F-TIP-17-11: The Operations Administration Policy (OAP) does not reflect where TGV data is stored, and the Standard Operating Procedure (SOP) does not pinpoint the location of calibration rails.	- Update TGV policies and procedures to include specific requirements for the storage of data collected and the location of calibration rails on the yard maps.
F-TIP-17-12: There is no requirement for an engineering assessment of track inspection data.	- Establish written requirements for periodic assessments of track inspection data by Track Engineering (MOWE), incorporating a combination of track inspection reports, field inspection, and historical data.
F-TIP-17-13: The TGV gauge defects are reviewed manually.	- Develop methods for post-run scripts that can process and validate the data to reduce the amount of manual data entry required.

Required Action

QICO-TIP-17-04: Establish and update processes to better utilize the potential of the TGV, outlining requirements for engineering review of data it produces.

(Risk Rating: Elevated)

Plan Description

F-TIP-17-11: Existing TGV polices will be updated to include specific requirements for the storage of collected data within 60 days of this dated response. The current SOP contains a description of the location of calibration rails at each rail yard with photo, and map. The SOP will be strengthened to show the location of the calibration rails on the yard map.

F-TIP-17-12: MOWE/TRST will develop a Track Assessment business plan and flow chart on collection, analysis, and storage of data, with staff responsibilities. Currently MOWE has two Position Control Numbers (PCNs) to be hired and the Assistant General Manager (AGM) for Rail Operations is working to provide the staffing needed.

F-TIP-17-13: The current process of manual review of the TGV's computer generated defect exceptions is valid and is currently the most efficient method. The random attributes of false exceptions and other non-applicable data requiring editing can be identified and corrected by trained staff. Reliance on scripting may be too complex due to the random nature of the non-applicable data. WMATA IT is planning to evaluate whether the editing processes can be automated through algorithms.

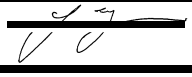
Business Impact – Budget/Cost Estimate

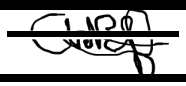
- **Process Improvement** – A current process/procedure needs to be optimized to address the QICO Required Action. This initiative does not need additional resources because current manpower will be used to improve the process.

PLAN SCHEDULE					
Actionable items		Description	Responsible Party	Estimated Start	Estimated Completion
1	Updated TGV polices	Policies will be updated to include specific requirements for the storage of collected data within 60 days.	Ravi Amin (MOWE)	05/10/17	09/28/17
2	MOWE Organization Chart	MOWE organizational structure, to include open positions yet to be staffed.	Ravi Amin (MOWE)	05/10/17	05/30/17
3	Maximo Data Business Plan	Maintenance-of-Way Engineering (MOWE) will establish a track assessment business plan and flow chart to direct collection, analysis, and storage of data, including staff responsibilities for MOWE and TRST.	Laura Mason (MOWE)	05/10/17	06/30/17
4	Data Validation Update	Results from research into alternate methods of TGV defect data analysis.	Ravi Amin (MOWE)	05/10/17	12/28/17
5	QICO CAP Verification Report	QICO will evaluate actionable items submitted to confirm there is reasonable evidence that the findings and this required action have been resolved, taking into account the actionable item descriptions and performance measures.	QICO	12/28/17	01/30/18

**In the event of personnel or departmental changes, responsibilities for actionable items shall transfer to the new leadership.*

COMPLETION DOCUMENTATION
Performance Measures
- 100% of TGV data collected is stored in accordance with updated policies.

RESPONSIBLE PARTIES		
MOWE	Ravi Amin	
MOWE	Laura Mason	

SECOND LEVEL RESPONSIBILITY		
AGM RAIL	Andrew Off	

8 SUPPLEMENTAL MATERIALS

8.1 APPENDIX A: RISK ASSESSMENT

Risk Assessment

What is Risk?

Risk is defined as an uncertain event or condition that, if it occurs, has a positive or negative effect on the organization's objectives and operations (both threats and opportunities). It is assessed on the combination of the probability of occurrence of risk and the severity of the risk.

Risk management is an attempt to answer the following questions:

- What can go wrong? – The Risk
- How bad are the consequences? – The Impact
- How often does/will it happen? – The Probability of Occurrence
- Is the risk acceptable? – The Risk Treatment, Remediation

Categories of Risk

- *Safety* – Risk associated with harm to customers and employees and critical equipment or asset safety
- *Governance* – Risks associated with internal controls and compliance
- *Operational* – Risk related to inefficient and ineffective business processes, disruption to normal business operations, non-compliance, negative public relations, breach to physical security, etc.
- *External* – Risks related to changing regulations, unfavourable economic conditions, industry or customer needs change, litigation and damage/loss to company assets
- *Financial* – Risks associated with uncollectable receivables, incorrect financial models or analysis, fluctuation in capital levels and adverse movement of interest rates
- *Technological* – Risk associated with unauthorized access to information, unavailable or unreliable information, technology not meeting business needs and compromised information security

Risk Assessment

The following risk matrix (Figure 1) was used to assess risks within the universe of review areas. The universe (see Table 1) is comprised of the potential range of all review activities and review business units (or departments) that fall within QICO's scope and oversight authority. These business units consist of programs, processes, assets and people which together contribute to the fulfilment of the departments' strategic goals (Goal 1 - Build Safety Culture; Goal 2 - Deliver Quality Service; Goal 3 - Improve Regional Mobility; and Goal 4 - Ensure Fiscal Stability).

Risks are assessed based on the probability of occurrence (see vertical axis in Figure 1) and the significance of their impact (see horizontal axis in Figure 1). The probability ratings are rated on a scale of 1 (minimum) to 5 (maximum) and are driven by the metrics shown on the next page. The impacts ratings are also rated on a scale of 1 (minimum) to 5 (maximum) and are driven by the category of risks, which are then aligned on the metrics shown on the next page.

Each finding is given a severity rating of Insignificant, Low, Moderate, Elevated or High. All areas with Elevated / High ratings are considered to be high risk to the organization's objectives; and need to be mitigated/ reduced in severity at the earliest. The risk ratings to the findings are provided as "Type of Risk" followed by "Severity Rating (Impact, Probability)" (e.g. a finding with *"Elevated (4 , 3)"* would mean a 'significant (4)' impact along with a 'possible (3)' probability of occurrence)

Figure 1 : Risk Assessment Matrix

Probability of Occurrence	Negligible (1)	Minor (2)	Moderate (3)	Significant (4)	Major (5)
Almost Certain (5)	Low	Moderate	Elevated	High	High
Likely (4)	Low	Low	Moderate	Elevated	High
Possible (3)	Low	Low	Moderate	Elevated	Elevated
Unlikely (2)	Insignificant	Low	Low	Moderate	Moderate
Rare (1)	Insignificant	Insignificant	Low	Moderate	Moderate
Probability	**Impact**		Potential Impact of Risk		

8.1 APPENDIX A: RISK ASSESSMENT

Risk Assessment

Probability of Occurrence of Risk Events Defined

Rare | 1 – Reasonable assumption that this risk will not occur

Unlikely | 2 – Reasonable assumption that this risk will likely not occur

Possible | 3 – Reasonable assumption that this risk may occur

Likely | 4 – Reasonable assumption that this risk will likely occur

Almost Certain | 5 – Reasonable assumption that this will occur

Potential Impact of Risk Events Defined

Negligible | 1 – Unlikely to cause the activity to fail to meet part of its objectives.

Minor | 2 – May cause a failure of the business process to meet part of its objectives, which may expose Metro to minor financial losses, less-effective or efficient operations, some non- compliance with laws and regulations, waste of resources, etc.

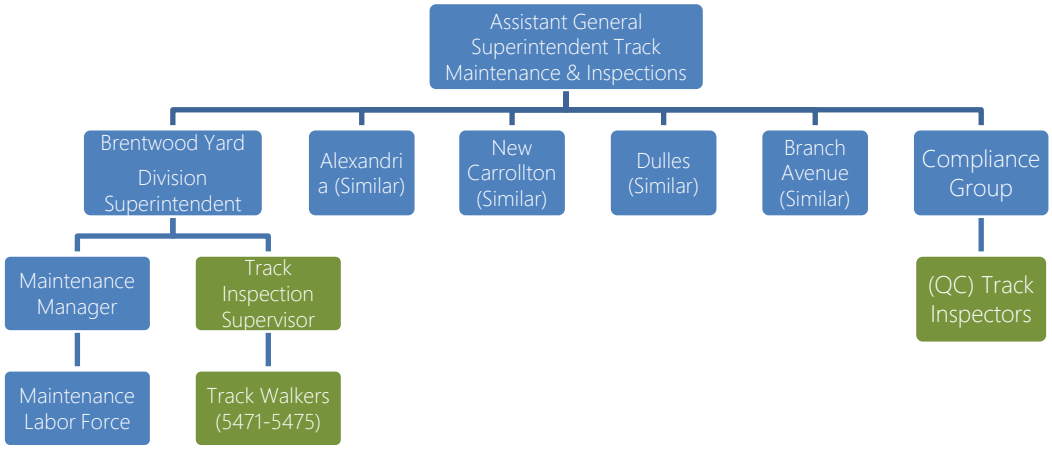
Moderate | 3 – May cause a failure of the business process to meet a significant part of its objectives, or negatively impact the objectives of other activities, which may expose Metro to significant financial losses, reductions to or ineffectiveness of operations, non- compliance with laws and regulations, sizable waste of resources, etc.

Significant | 4 – Likely to cause a failure of the business process to meet a significant part of its objectives, or negatively impact the objectives of other activities, which may expose Metro to significant financial losses, reductions to or ineffectiveness of operations, non-compliance with laws and regulations, sizable waste of resources, etc.

Major | 5 – Will cause a failure of the business process to meet its objectives, or cause objective failure in other activities, which may cause or expose Metro to major financial losses, interruptions in operations, failure to comply with laws and regulations, major waste of resources, failure to achieve stated goals, etc.

8.2 APPENDIX B: WALKING TRACK INSPECTIONS

Walking Track Inspections



Trackwalking Force Snapshot
Source: (Position Management Report, March 2017)

Class	Track Walkers
AA (5+ years)	11 (16)
A (4 years)	4 (5)
B (3 years)	8 (8)
C (2 years)	9 (10)
D (recent hire)	6 (7)
Total In-House	38 (46)
Contractors	9
Total Track Walking Force	47

(Parentheses above include QC inspectors)

Size of Force and Recruitment: As of March 20, 2017, Metrorail utilizes 38 in-house track walkers (positions 5471 – 5475) and 9 contractors for daily track walking inspection. There are other employees classified as "Track Walkers," but are utilized for other Track and Structures functions (e.g. quality control for SafeTrack). The total numbers including these employees are shown in parentheses in the above table. Entry-level track walkers (D) are identified either through recruitment from outside of WMATA or the "Union Pick." Candidates need two years track experience (for example: repairman), though not necessarily from WMATA. As a result of an investigation in 2016, WMATA is instituting a 6-week in-depth retraining at Carmen Turner Facility for all track walking personnel and leadership.

Organizational Structure: Track walkers report to five regional offices (Brentwood, Alexandria, New Carrollton, Dulles, and Branch Avenue) according to proximity to their assigned section of track; in this fashion, the entire Metrorail system is covered. Each regional office is governed by a superintendent, who oversees both maintenance and track inspections for his/her region; a Track Inspection Supervisor (position 5569) schedules the daily track walking inspections/weekly switch inspection inspections, oversees the creation of Maximo reports, discusses defects, and occasionally (every two months) walks track to QC track.

Track Inspection Process: Teams of two track walkers are responsible for walking their designated section of mainline track (which consists of up to six route miles / twelve track miles) twice weekly, during non-peak revenue operation (1000-1500), against the direction of traffic. A typical walk is on the order of 5-miles of track; if at the end of the week a section of track isn't inspected twice a non-compliance form is completed and submitted to the track inspection supervisor. Track Inspectors have the authority to call into Operations Control Center (OCC) and Maintenance Operations Center (MOC) to identify a speed restriction or black condition.

Track-Walking Safety: One track walker must act as a watchman-lookout, while the other is responsible for the inspection. Mainline track in the vicinity of Greenbelt Test Track and the NOMA B35 Double-Crossover are areas with clearance issues and must be inspected at night; the core area of the C-Line and D-Line is also inspected at night due to the high frequency of trains. They are required to submit defects that they encounter during their track walks in both paper and electronic formats (Maximo), categorizing defects with a defect code (e.g. "spike killed").

8.3 APPENDIX C: TRACK GEOMETRY VEHICLE OPERATION

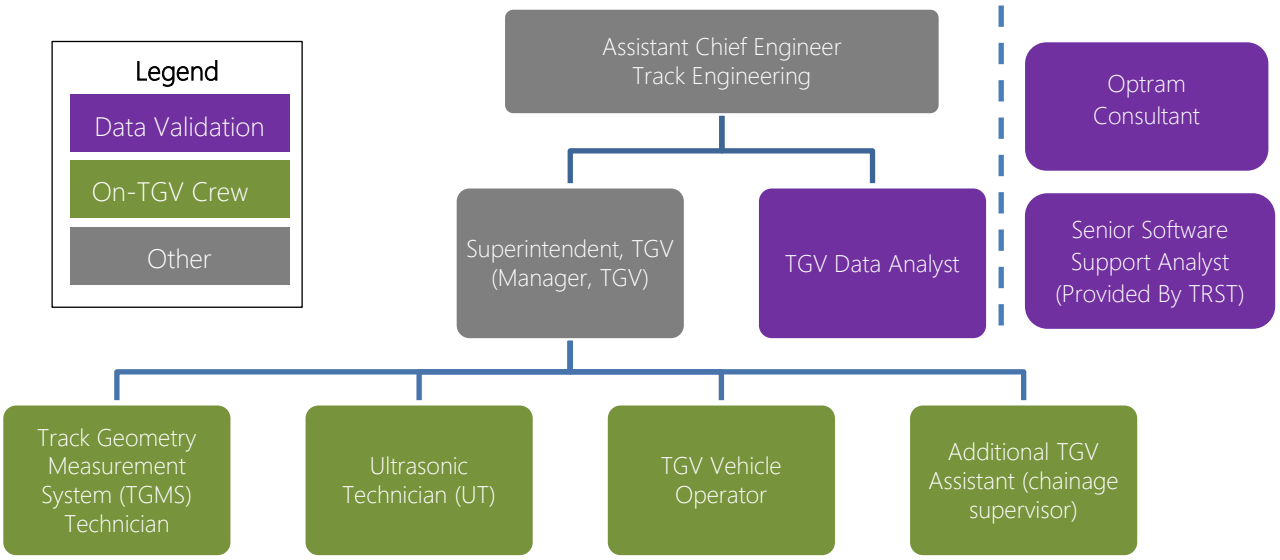
Track Geometry Vehicle (TGV) Operation

Scope and Frequency: The Track Geometry Vehicle (TGV) was commissioned in 2012-2013 to replace automated track inspection services that were previously contracted out. It provides a similar function to automated systems used for freight railroads, with customization for transit-specific parameters (third rail and platform geometry). There are three major types of TGV inspections.

a) Track Geometry – twice yearly for all mainline track. These inspections typically cover an entire route at a minimum (e.g. A-Line, consisting of tracks A1/A2). They can be conducted a higher speeds and even inserted between revenue train operation during the day. The current practice is to conduct testing at night, with a chase-unit to fix any detected black-level defects. The collected parameters include
   - Track Geometry: Gauge, Rail Profile, Cross Level, and Alignment (horizontal and vertical).
   - Platform Geometry: Relative height and gap between the dynamic envelope and the platform.
   - Contact (Third) Rail Geometry: Both horizontal and vertical offsets

b) Ultrasonic Defect Scanning – twice yearly for mainline track. These inspections are slow-speed (10-15 mph) ultrasonic scans of the running rail head, identifying rail head defects (e.g. TDD-Transverse Detail Defect). Any black level defects are remedied by a chase-unit.

c) As Needed Inspections – some inspections utilize additional capabilities of the TGV. Examples include Automatic Train Control (ATC) impedance bond signal levels and infrared scanning for traction power "Hot Spots." These are used on an as-needed basis, as departments have developed separate solutions. The TGV has also been utilized for other requests, including operational incidents and as SafeTrack quality control functions.



Personnel: The Track Geometry Vehicle Team consists of two types of personnel:

a) An on-board crew which operates the vehicle during track geometry and ultrasonic rail scanning runs. Support is provided to the TGV by a chase unit (staffed by track maintenance personnel), which follow the TGV in the event a black or red condition is detected, after which the unit will perform emergency maintenance. The major roles for the on-board crew include:
   1. Track Geometry Vehicle Operator (2 employees currently certified) – trained to operate the vehicle for both night-time and revenue operation. Requires 6-weeks in class, 4-weeks on the job (both at WMATA).

8.3 APPENDIX C: TRACK GEOMETRY VEHICLE OPERATION

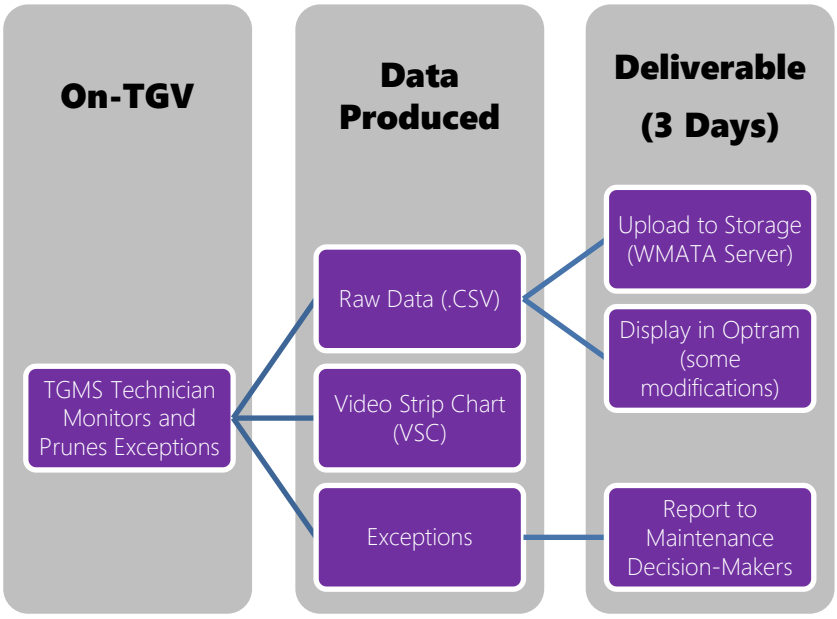
Track Geometry Vehicle (TGV) Operation

2. Track Geometry Measurement System (TGMS) Technician - monitors the track geometry instrumentation during the TGV run. Signals to stop the vehicle in the event of a black-level defect. Requires one week of training, provided by the vendor (ENSCO).
3. Ultrasonic Technician – monitors the ultrasonic testing instrumentation for UT testing runs. Requires 2-weeks of Non-Destructive Testing (NDT) certification (which usually occurs out-of-state).
4. Dead-reckoning System Tech – required to periodically sync the TGV to the observed chainmarker on the roadway. Little training required in comparison to the other techs, but required to be technically literate in track terminology.

b) A data validation team (currently consisting of one TGV Data Analyst (track engineer) and one software support analyst from TRST) which checks the defects detected by the TGV for false positives, prunes them from the defect list if encountered, and submits an updated defect list to maintenance decision makers. In addition, WMATA utilizes the expertise of a consultant for Optram, who tailors the maintenance planning software to handle a variety of data inputs (TGV data included) to serve WMATA's maintenance management team better.

Data Validation Process: Collected foot-by-foot for all track geometry parameters, raw data is exported as a comma-separated-value (.CSV) file. Threshold files, containing tolerances set forth in the WMATA-1000 (TRST) "Track Maintenance and Inspection Manual," are uploaded to the TGV's computers; any exceptions to these tolerances during the track geometry run are automatically logged and categorized by color (severity).

a) Some exceptions listed as false-positives are pruned out of the exception data file by on-board TGMS technicians. This function is necessary to correctly task the maintenance chase unit to fix black-level defects.
b) TRST Software Support Analyst uploads the raw data unaltered, onto a WMATA internal server for long-term storage.
c) The TGV Data Analyst compares the exception report received from the TGV run, and compares it to the raw-data file to double check the false-positives pruned out by the TGMS technician. The TGV analyst further prunes/re-classifies the exceptions by comparing the Video Strip Chart (which denotes the position of special trackwork features that typically raise false-positives) with the Exception Data. A list of critical exceptions is emailed to maintenance decision-makers within Track and Structures (TRST).



Optram: TGV geometry waveforms and UT runs are currently displayed in Optram, which displays Metrorail's track charts side-by-side with customized data swimlanes for each major type of track geometry parameter. Historical TGV runs are overlapped over one another for trending purposes. Optram also aggregates track defect data noted by the Track Inspectors (piping data from Maximo) for comparison.

8.4 APPENDIX D: OTHER FORMS OF TRACK INSPECTION

Other Forms of Track Inspection

a) Office of Compliance Inspections – Track and Structures (TRST)'s compliance office employs several walking track inspectors that provide Quality Control (QC) inspections for Metrorail's SafeTrack program, perform investigative inspections (e.g. derailments), and spot-check walking track inspections and conditions reported by MOC.

b) Track Engineering Inspections – Track Engineering (MOWE) conducts investigative inspections in order to determine root-causes of systematic issues affecting the track structure, utilizing information collected from track walkers and Track Geometry Vehicle (TGV) runs.

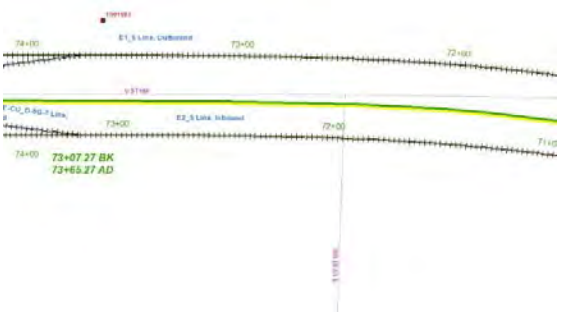
c) Automated Timber Tie Scoring – for ballasted portions of track, Metrorail has utilized a third-party to provide timber tie scanning services, which scan the interior of the each tie and assign a grading. The data is imported and displayed with a color scale in Optram.

d) Vehicle Track Dynamic Monitor System - a ride quality system that measures carbody lateral, carbody vertical, truck lateral, and axle vertical accelerations. 7000 series cars are equipped with a system of accelerometers that are mounted on 15% of the B cars. Discrepancies are classified as Urgent, Semi-urgent or priority and are mapped by latitude/longitude coordinates and/or chainmarker. Railcar Engineering (RAIL:CENV) is the custodian of the system, but data is occasionally shared with Track Engineering (RAIL:MOWE) through a third-party website (TrackIT), as ride quality can infer problems with the track (e.g. bad rail joints).

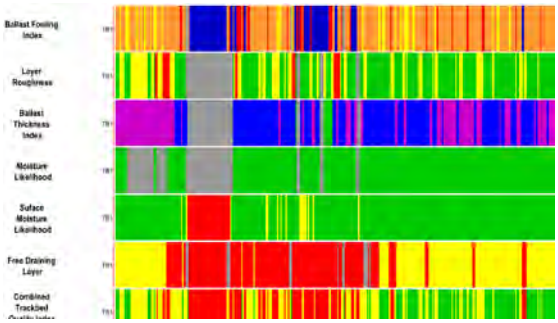
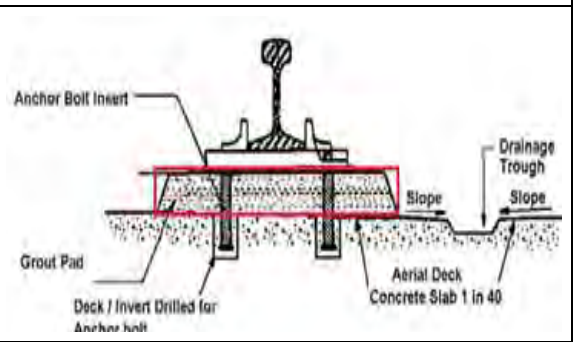
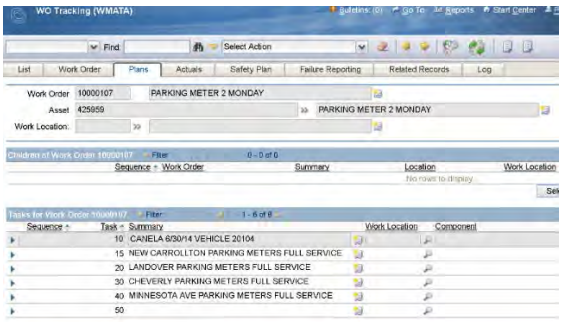
e) Ground Penetrating Radar (GPR) – third party inspection that uses radar pulses to scan integrity issues with the Track Substructure (Ballast, Sub-ballast, and the interface with the Subgrade). Six different metrics are scanned (ballast fouling, layer roughness, ballast thickness, moisture likelihood, surface moisture, free draining layer rating) and averaged into a Combined Trackbed Quality Index (CTQI). Some of these properties are those that track walkers cannot directly observe. This data is displayed as a swimlane in Optram. Preliminary testing began in 2016, and issues with electromagnetic interference have degraded the received data quality.

f) Automated Lateral Load Testing – an automated, third party inspection whereby a railbound vehicle applies lateral load the rails, measuring the deflection and inferring the adequacy of the track fastening system, particularly for direct fixation track. The data can be loaded into Optram; however, there has been significant data-quality issues, some of which are tied to the pruning algorithm, which pruned out real defects by accident.

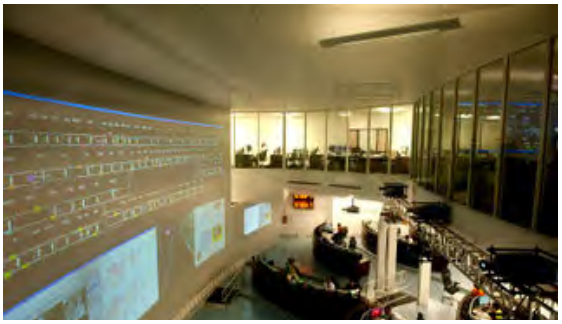
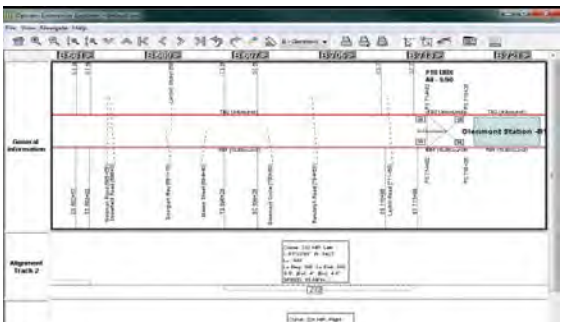
8.5 APPENDIX E: TECHNICAL TERMINOLOGY

Definitions	Photos
Ballasted Track Track structure consisting of ballast (rock), timber ties (typical, with longer ties to accommodate contact rail insulators), and tie-plates clipped to the running rails.	
Chainmaker (Chain Marker) WMATA's rail system consists of 234+ miles of mainline track, almost half of which is underground. While one could use latitude / longitude values to pinpoint any asset/incident along the track, in many cases it is appropriate to use chain makers, which answers the question: "How many feet is x from the start of the track?"	
Direct Fixation Track Unlike "Ballasted Track", direct fixation uses elastomer fasteners to secure the running rails to a concrete slab (through the grout pad). Typical of tunnelled and aerial Metrorail track.	
Direct Fixation Fastener A track superstructure component that transfers vertical, lateral, and longitudinal forces from the running rails to the stiffer concrete slab below, while providing some deflection for mitigating impact forces. Shown to the right are typical "F-20" fasteners. As stated in WMATA's Track Inspection and Maintenance Manual (WMATA-1000 Revision 6, January 2015), fasteners are spaced at 30" on direct fixation track (Section 7.1). In practice, fasteners are often spaced less than 30".	
Equation (Track) Station change equation for curves: if two tracks both curve, the outside track will run a longer distance than the inside track. Thus, when the tracks return to tangency, the track which trailed will have chainage added to it in order to "catch up" with the other track.	

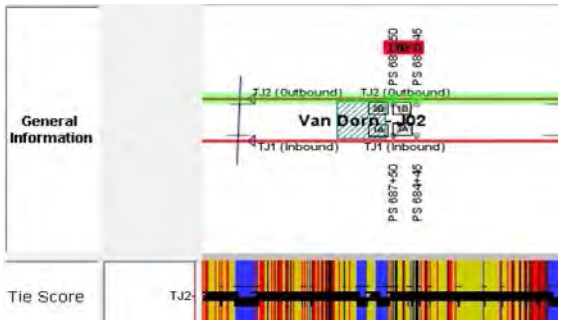
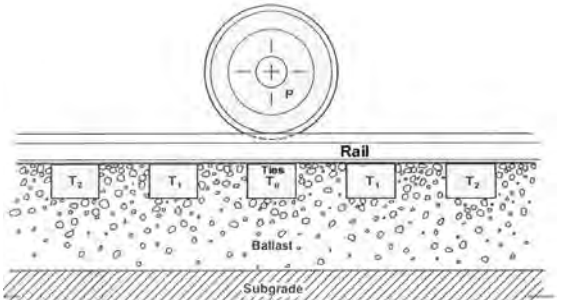
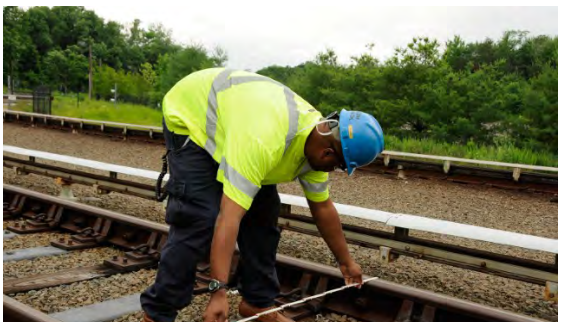
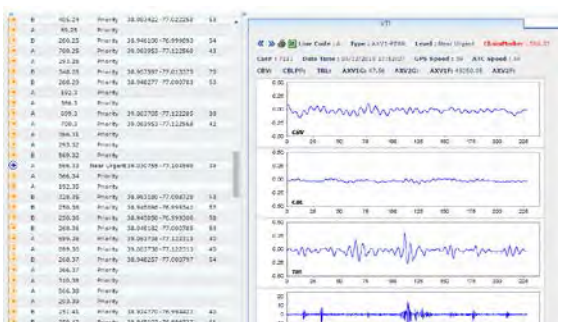
8.5 APPENDIX E: TECHNICAL TERMINOLOGY

Definitions	Photos
Green, Yellow, Red, Black (Serviceability) There are three categories of 'limited states' for track and structures; serviceable, damaged and failed. This methodology is adapted to define three (3) distinct "operational" conditions that define the state of transit track structure at any time - Green (3), Yellow (2) and Red (1). Each color-coded condition assessment represents the prioritized order in which the corrective action(s) is performed. In addition, a fourth category prohibits service over an affected area and is described as Black (0) which represents an out of service condition.	
Ground Penetrating Radar (GPR) Ground Penetrating Radar uses radar pulses to scan integrity issues with the Track Substructure (Ballast, Sub-ballast, and the interface with the Subgrade). Six different metrics are scanned (ballast fouling, layer roughness, ballast thickness, moisture likelihood, surface moisture, free draining layer rating) and averaged into a Combined Trackbed Quality Index (CTQI).	
Gauge Rod A temporary strut used to hold a wide gauge condition from widening. Wide Gauge typically refers to a widening of track gauge (the distance between the Running Rails) outside intended tolerances (as set forth in WMATA-1000 and the Design Criteria). A severe wide gauge condition increases the chance of a derailment.	
Grout Pad In Metrorail direct fixation (concrete slab) track, rail fasteners sit upon grout pads, typically 2" in depth and up to 20 feet in length. Grout pads act as a leveling course between the underside of the fastener and the reinforced concrete deck (or invert) below; anchor bolts anchor the fastener, through the grout pad, to better anchoring conditions in the reinforced concrete deck/invert. Remediated grout pads mixtures consist of repair mortar, pea-gravel and water, mixed in accordance with manufacturer's specifications with tolerances for workability.	
Maximo Maximo is WMATA's maintenance management system used for work order, incident, and track defect tracking. Maximo Work Orders (WO) specify a particular task and the labor, materials, services, and tools required to complete the task.	

8.5 APPENDIX E: TECHNICAL TERMINOLOGY

Definitions	Photos
SOP and OAP An Operations Administrative Policy (OAP) establishes administrative policies applicable to specified Operations administrative and management activities. These policies apply to employees, at all levels. Standard Operating Procedures (SOP) delineate responsibilities and procedures for performing certain Metrorail functions. These are not just limited to safety (e.g. SOP #30 Establishment and Removal of Speed Restriction for the Mainline), but can also refer to engineering procedures.	 Washington Metropolitan Area Transit Authority DEPARTMENTS OF DEPUTY GENERAL MANAGER, OPERATIONS AND ASSISTANT GENERAL MANAGER, BUS SERVICES Operations Administrative Policy CATEGORY: Organization and Administration TOPIC: Operations Administrative Policy (OAP) OAP NO.: 100-01 TITLE: Operations Administrative Policy (OAP): Creation, Review, Revision and Rescission LATEST REVISION NO.: 6 ORIGINATION DATE: Unknown DATE REVIEW DUE: August 28, 2016 EXPIRATION DATE: None LATEST REVISION DATE: August 28, 2014 LATEST REVIEW DATE: August 28, 2014
Special Trackwork Broadly speaking, special trackwork refers to any non-standard track arrangement. A "standard" cross section of track would involve two running rails (possibly with a guard rail or restraining rail) with ballasted or direct fixation fastening systems. At Metrorail, "switch", "turnout", "crossover", and "interlocking" are generally interchangeable special trackwork terms, although strictly refer to different things.	
Speed Restriction A given speed less than the normal operating speed for a section for track or rail vehicle/equipment. This speed is imposed by verbal instructions, written notices (i.e. RSA's or general orders), flagging procedures and/or speed commands issued by ROCC to mitigate special situations.	 MEDIUM STOP SPEED RESTRICTION NORMAL SLOW RECEIVER POWER ON OFF AF-800W TRACK
Operations Control Center (OCC) / Maintenance Operations Center Train operations on the Metrorail system are carried out under the authority and supervision of the Metrorail Operations Control Center (OCC/ROCC), located at Carmen Turner Facility (CTF). Maintenance Operations Center (MOC) handles the dispatching of emergency maintenance teams; for track, this includes handling emergency maintenance for speed restrictions.	
Optram Optram is a track and structures asset viewer working in conjunction with Maximo. It shows track alignment, stationing, type of structure, vertical and horizontal profiles, traction power zones, train control circuits, and historical as-built drawings for the entire Metrorail system. Work order history from Maximo is imported as well as track geometry vehicle data to aid track maintenance and engineering planning.	

8.5 APPENDIX E: TECHNICAL TERMINOLOGY

Definitions	Photos
Tie Scoring For ballasted portions of track, Metrorail has utilized a third-party to provide timber tie scanning services, which scan the interior of the each tie and assign a grading. The data is imported and displayed with a color scale in Optram.	
Track Structure The intense vertical and horizontal loads from the steel wheels of a Metrorail train are distributed through the Track Structure to foundational elements (subgrade, tunnel structure, or bridge structure).	
Track Geometry Vehicle The Track Geometry Vehicle (colloquially known as "The Pickle") is an in-house inspection vehicle that continually scans the track as it travels throughout the Metrorail system; the data collected provides insights for Track Maintenance planning (uploaded into Optram).	
Track Walking Inspection (Track Walkers) Track walking inspection, accomplished on foot daily, is the authority's primary method for observing and recording deterioration that could adversely affect Metrorail operations. Track Walkers collectively inspect every route mile of Metrorail twice per week, recording defects affecting any railway asset within their field of view.	
Vehicle Track Dynamic Monitor System (V/TI) A ride quality system that measures carbody lateral, carbody vertical, truck lateral, and axle vertical accelerations. 7000 series cars are equipped with a system of accelerometers that are mounted on 15% of the B cars.	

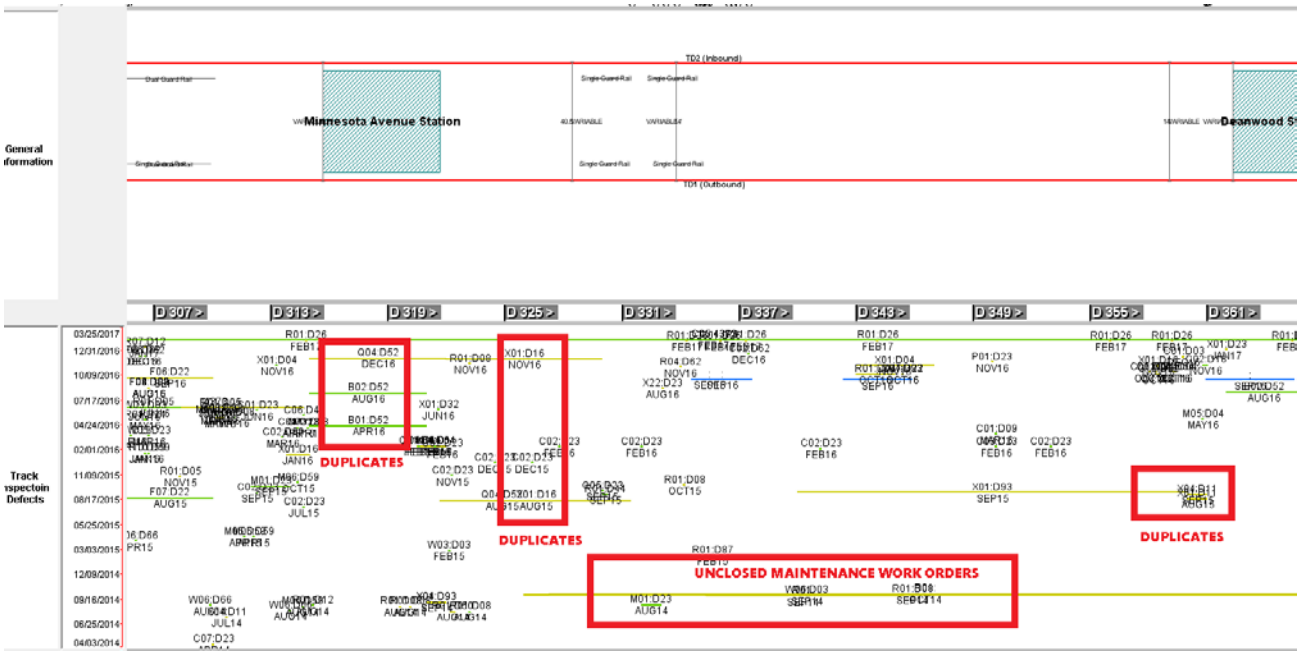
8.5 APPENDIX E: TECHNICAL TERMINOLOGY

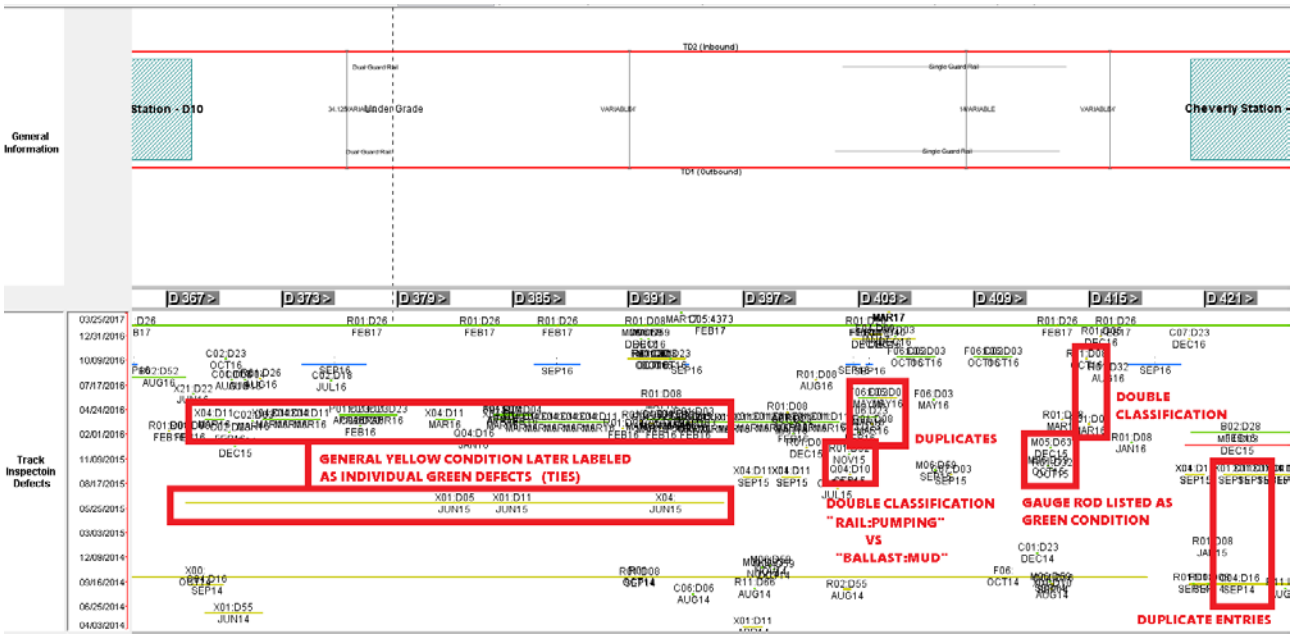
Definitions	Photos
WMATA-1000, WMATA-2000 The Track Maintenance and Inspection Manual, colloquially known as WMATA-1000 (TRST) is the maintenance and inspection manual for track. Not to be confused with WMATA-2000, which is the TRST Maintenance Control Policy (e.g. procedures to follow for speed-restrictions).	

8.6 APPENDIX F: OPTRAM SCREENSHOTS

Optram Screenshots

8.6.1 MINNESOTA AVENUE – CHEVERLY STATION, 2014-2017 (TRACK INSPECTION PREFERENCE FILE)

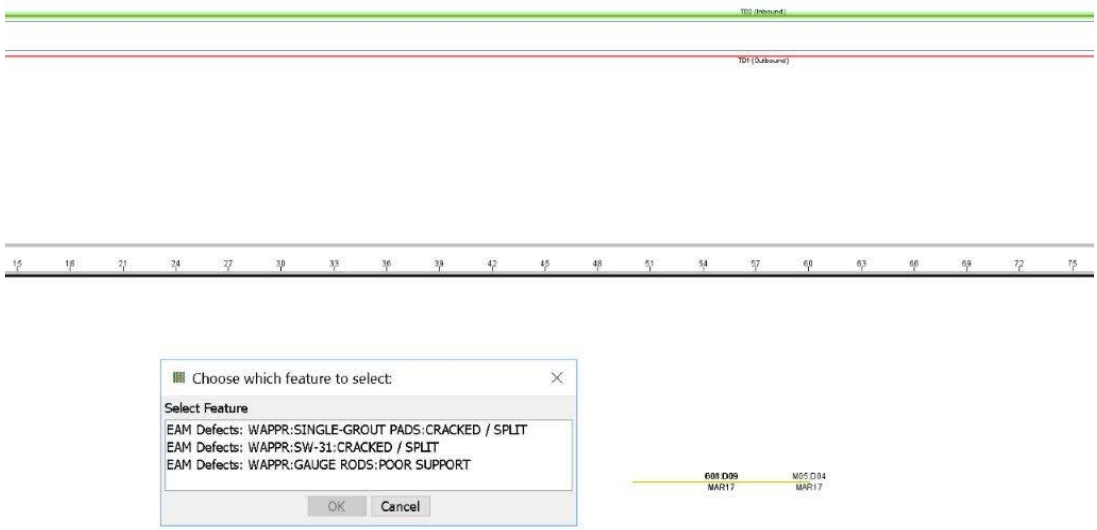




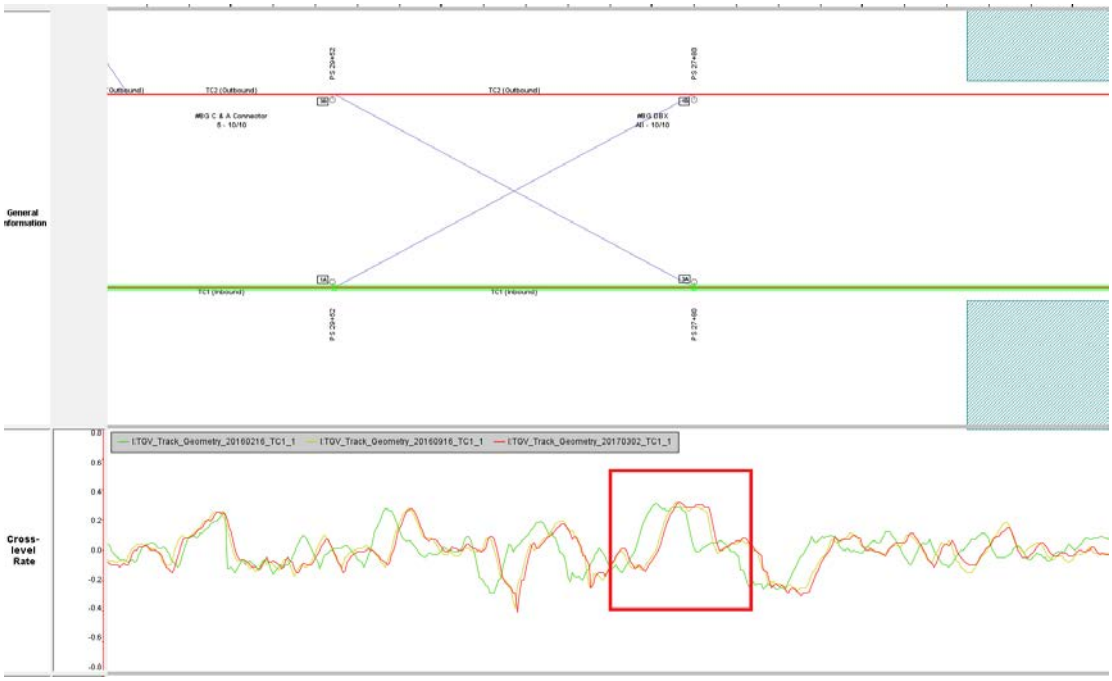
8.6 APPENDIX F: OPTRAM SCREENSHOTS

Optram Screenshots

8.6.2 TYPICAL GAUGE-ROD DEFECT (D1 404+50)



8.6.3 EXAMPLE OF OFFSETTING ERRORS FOR TGV RUNS



8.7 APPENDIX G: QICO REVIEW OF DOCUMENTATION

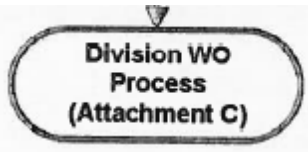
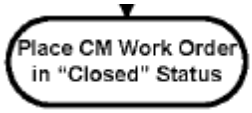
INFRASTRUCTURE ASSURANCE PROGRAM

ENGINEERING DOCUMENTATION REVIEW

Background Information	
QICO Auditor: [redacted] Document Title: Track Geometry Vehicle Inspection Policy Document Number: OAP No. 114-01 (2015)	The infrastructure assurance group of Quality, Internal Compliance and Oversight (QICO) conducted a review of OAP 114-01 as part of the track inspection audit for the 2017 QICO Systemwide Audit of Metrorail business processes.

REPORT DETAILS		
Item Number	Source Text	Commentary
1	Ensure the TGV Superintendent(s) has thorough knowledge and understanding of this OAP, any changes to this OAP through their regular meetings and/or through the WMATA email system and fully comply with all policies and requirements herein. The email notification will identify the link where the OAP resides in a WMATA approved document repository. (Page 1)	- Item 3.2 lists e-mail notification to identify link. Will e-mails suffice for an audit of the process?
2	Ensure assigned Supervisor(s) has thorough knowledge and understanding of this OAP, any changes to this OAP through their regular meetings and/or through the WMATA email system and fully comply with all policies and requirements herein. The email notification will identify the link where the OAP resides in a WMATA approved document repository. (Page 1)	- Item 3.3.1 indicates regular meetings and/or e-mail system. An acceptable contact interval should be established for this item and identify where the information is to be retained (document repository).
3	"4.1 Level I UT Certification: Level I technicians, persons qualified to perform specific calibrations and tests, and acceptance or rejection determinations allow little or no deviation from the procedure. Level I technicians are under close supervision and direction of a higher level tester." (Page 2)	- Items 4.1, 4.2 have certifications, but do not indicate a certification period. Is the certification period two years?
4	**TGV Senior Software Support Analyst:** This position will review the raw and exception data files to ensure the data is in a format that can be loaded into the Optram linear asset decision support management system. (Page 2)	Item 4.4 indicates Optram Linear asset decision support management system. Where is this information defined, i.e; SOP #?

5	a) Track Geometry: Alignment attributes, Cross-level, Rail Profile, Run-Off, Warp, Twist, Gauge, Power Rail Gauge, Cover Board Height, and Platform position. The equipment is also capable of testing Signals and Thermal Imaging. (Page 2)	Item 4.6 (a) lists TGV gathered information. The strip chart shown in WMATA 1000 (pgs 11-20) does not indicate measurements for 3rd rail nor for platform. Additionally, the indication of "capability" does not indicate whether this information is gathered, nor how it would be retained and analyzed.
6	5. ABBREVIATIONS and ACRONYMS (page 3)	Definitions of abbreviations should also include MOC – Maintenance Operations Control.
7	3. Track Gauge * (Page 4)	This should indicate "under load" since it is being gathered from the passing of the TGV. This is different than tape or gauge readings that do not load the track.
8	6.2 Data, Exception and Defect Reports generated must be saved and forwarded to the TGV Data Analyst of Track, Structures and Facilities Engineering (TSFA) and the TGV Superintendent (TSFA) – TGV for analysis, distribution, and storage. (Page 5)	The location where data is stored, where exception reports are maintained and where defect reports are stored, should be identified. This data's use should be indicated for the process that creates work orders, follow the repair sequence and through the close-out process.
9	6.10.1 Certification of the TGMS Technician requires one (1) week of TGMS training delivered by the TGMS manufacturer. In addition, the TGMS Technician will demonstrate their competency of the TGMS while conducting a mock-test in the yard track. This demonstration will be performed to the satisfaction of the TGV Superintendent. (page 5)	What is the procedure if the mock test is not satisfactorily completed?
10	TGV data files taken directly from the TGV are typically titled by testing date and a unique testing identification number. These files are not titled by chain marker, line, or route. Therefore, the TGV Senior Software Support Analyst is required to open each file and rename the file in accordance with Optram policy referenced in the Attachments of SOP 114-01, Track Geometry Vehicle Inspection Procedure. (Page 6)	How are chain markers, line and route determined and made part of the readings? Is there a method to use the current vehicle readers spaced along the right-of-way to provide to trigger the read of a chain marker? The Optram policy for data acquisition and verification of incidence of duplication should be established.
11	 (Page 8)	The end process indicates e-mails are sent. Where are these sent? Is Optram updated with the defect correction/removal?

12	 (Page 9)	This end point seems to begin on the chart (Page 9) in the center of the page, mid-flow of this chart.
13	 (Page 11)	What level of Authority determines that CM work is complete? How is Optram and Maximo updated to show this work is completed and defect removed?

INFRASTRUCTURE ASSURANCE PROGRAM

ENGINEERING DOCUMENTATION REVIEW

Background Information	
QICO Auditor: [redacted] Document Title: Track Geometry Vehicle Inspection Policy Document Number: SOP No. 114-01 (2015)	The infrastructure assurance group of Quality, Internal Compliance and Oversight (QICO) conducted a review of OAP 114-01 as part of the track inspection audit for the 2017 QICO Systemwide Audit of Metrorail business processes.

REPORT DETAILS		
Item Number	Source Text	Commentary
1	**Level II UT Certification:** Level II technicians are able to set up and calibrate equipment, conduct the inspection according to procedures, interpret, evaluate and document results in all the testing method(s) utilized by the certificate holder. The technician can provide on-the-job training for Level I and Level I Limited and act as a supervisor. The technician also organizes and documents the results of the inspection. They must be knowledgeable of all applicable codes, standards, and other documents that control the Non-Destructive Testing (NDT) method being utilized.[1] (Page 2)	- The reference (#1) is listed on page 3, not on page 2.
2	Track Geometry: Alignment, Cross-level, Rail Profile, Run-Off, Warp, Twist, Gauge, Power Rail Gauge, Cover Board Height, and Platform position. The equipment is also capable of testing Wayside Signals and Thermal Imaging. (Page 2)	Strip charts do not show 3rd rail information. The strip chart shown in WMATA 1000 (pgs 11-20) does not indicate measurements for 3rd rail nor for platform. Additionally, the indication of "capability" does not indicate whether this information is gathered, nor how it would be retained and analyzed.
3	**Ultrasound Calibration Test Block / Reference Standards:** Test block of running rail used to validate that the UT equipment and setup to assure proper calibration of test equipment is provided when performing UT testing. In order to achieve consistency of signal strength for size and distance, a calibration block is utilized to validate; by handheld unit; the integrity and accuracy of the test equipment prior to its use. International Institute of Welding (IIW) Type Calibration Block[1] utilized daily to ensure this accuracy (see Figure 1). (Page 3)	Where is this calibration kept? Is it on-board TGV equipment?
4	5. ABBREVIATIONS ai (Page 4)	Definitions of abbreviations should also include MOC – Maintenance Operations Control.

5	6.1.1.5 Maintain all records related to work activities such as Safety Briefings, Incident and Hazard Reporting (Safety Measurement System [SMS]), Vehicle Inspection Reports, and Testing Activities for a minimum five (5) years. 6.1.1.6 Maintain work order tracking and survey reporting through the use of the TGV Database, Maximo, and Optram. (Page 5)	Where are "all records" maintained? If the data shows there is a defect, what process captures the work order issuance, work product, work inspection and work order closure; as well as updating Optram for the removal of the defect?
6	Review and organize video files collected during Geometry runs; upload to a WMATA approved document repository. (Page 6)	Is there a quality procedure for verifying data base uploads?
7	**6.5 Track Geometry Measurement System (TGMS) Operations:** (Page 11)	How is track chaining captured?
8	Raw data biannually and exception data after each run will be loaded into Optram, all data may be viewed anytime via GEO Edit software. (Page 12)	Who has access to "GEO Edit software?" Does the view see raw data or reports and charts?
9	7.4 WMATA-100 Track Maintenance & Inspection Manual (Page 13)	WMATA-1000.
10	8. ATTACHMENTS (Page 13)	The attachments, especially the yard and calibration rail chart would be more useful if the test track is highlighted.
11	OPTRAM DATA MAINTANANCE (Page 41)	MAINTENANCE (spelling)
12	1.3 Feedback on this document or Data Update Tool. Questions regarding the Data Update Tool or this document can be addressed to The Net Consulting Group Inc. : [redacted] or 617-840-3456. (Page 43)	Will [redacted] always be available or should a more generic (Title) be used?

8.8 APPENDIX H: QICO INTERVIEWS OF KEY PERSONNEL

Quality Assurance, Internal Compliance & Oversight
Interview Notes

QICO PROGRAM	Track Inspection Audit				
LOCATION	Alexandria Yard (C99) Large Conference Room	DATE:	3/9/2017	TIME:	10:00 – 11:00

Background Information		
[redacted]	Assistant Chief Engineer, Track	Track Engineering
[redacted]	TGV Manager	MOWE:Track Engineering
[redacted]	Auditor	QICO:Infrastructure Assurance
[redacted]	Auditor	QICO:Infrastructure Assurance

Interview Notes		
Category	Question	Response
Overview	The TGV has recently changed ownership from Track and Structures (TRST) to Maintenance-of-Way Engineering (MOWE). At this time, what are the strategic goals of the TGV team going forward?	The overall strategic mission of the TGV will not change. The ultimate goal is to improve the TGV operation by cross-training staff in all aspects of TGV operation and analysis. This will potentially allow for increased testing during revenue hours (track geometry, and possibly ultrasonic scanning) under the philosophy that night-time should be kept clear for track maintenance activities. The TGV will also be uploaded with new standards set forth in the upcoming revision of the WMATA-1000. The original organization chart (circa 2012) envisioned a superintendent overseeing 10-15 union employees (on-board TGV team and data analysts). Additionally, WMATA vehicle engineers (Railcar Engineering and Maintenance, CENV and CMNT) were loaned to help with calibration issues. The TGV is currently operating under one superintendent, four on-vehicle staff, and two data analysts. Since moving to Maintenance-of-Way Engineering under Rail Operations (RAIL:MOWE), the intention is to add at least one position to the on-vehicle staff, and change job titles (e.g. Superintendent to TGV Manager) to reflect the change in union labor representation.
Roles and Responsibilities	What the roles and responsibilities of each on-board TGV Crew Member?	The ultimate goal is to have everybody cross-trained in each sub-disciplines. *A TGV car operator (2 people currently certified) *TGMS assistant (needed for both Geometry and UT). All trained. *Dead-reckoning System Tech (using the Thermoflex) *Ultrasonic Technician. UT tech (Only one)

		*Manager of TGV (scheduling the TGV and supervising the crew (not onboard)).
Training	What training is required of crew members, and is the an adequate redundancy (if team member leaves)?	For ultrasonic testing, techs are required to be a level 2, requiring two weeks in-class training in Connecticut (multiple companies providing the "non-destructive testing" class). Re-certification occurs every five years. Currently in plans two techs are going in May for UT certification, as only two are currently certified (TGV manager and UT Tech). TGMS: four people currently trained (ENSCO performs training on-site). One week of training (part of contract of ENSCO training and maintenance contract). TGV train operation: 6-weeks in class, 4-weeks on the job. It's important training to prepare operators for revenue-hour operation on mainline, which requires a heavy amount of manual control. Dead-reckoning System Tech - little training required in comparison to the other techs, but required to be technically literate in track terminology.
Planning	Accessing Track Rights	TGV is a priority at the GOTRS meetings (through understanding with the Chief of RAIL). We are always monitoring the schedule eight weeks out for Revenue Service Adjustments (RSA) and other critical work. TGV not scheduled through GOTRS. It is submitted through the RSA schedule. Geometry requires one whole route to be effective. While Optram data can be spliced together; but this is a process to be avoided.
Inspection Frequency	Mainline vs Yard (Twice vs Once). What is the rationale for this?	Twice is a minimum per year - more stringent than the current FRA standard (once per year). Geometry is being tested up to four times a year, including geometry collected during UT tests.
Other Inspections	Are there other requests for the TGV besides mandatory biannual tests?	Third rail request for profile issues. Operational incidents, per request (e.g. de-coupling incident). SafeTrack, with the before / after snapshot (checking quality of work)
Equipment Calibration	What is the lifespan of the TGV? How often does equipment have to be calibrated? How often is the TGV's system upgraded? Have there been delays due to calibration?	Uncertain on stated lifespan. Calibration has no-standard, but has been completed yearly by the vendor. Verification before every run in the yard (15 minutes), UT has test rails

Quality Assurance, Internal Compliance & Oversight
Interview Notes

AUDITEE	MOW Software				
LOCATION	Alexandria Yard (C99) Large Conference Room	DATE:	3/3/2017	TIME:	13:00 – 15:00

Background Information		
[redacted]	MOW Software Support	TRST, MOWE: Track Engineering
[redacted]	Quality Engineer	QICO: Infrastructure Assurance
[redacted]	Quality Officer	QICO: Infrastructure Assurance

Interview Notes

Category	Question	Response
Third Party Inspections	What has been your experience with Third Party (other than TGV) Inspections	Lateral Load Data could have been uploaded into Optram. However, the company that conducted the automated testing had trouble with the pruning algorithm, which pruned out real defects by accident. Tie Scoring Data and GPR also had problems reading some areas (non-readable).
Quality of Work	How can we alleviate the amount of human post-processing / data validation necessary for pruning false positives?	It is possible to validate exceptions automatically using scripting that can executed after the run to prune the wide-gauge false positives (based upon the two-gauge standard that WMATA utilizes). However, this issue will be likely resolved after the next revision of the WMATA-1000 is released, which simplifies gauge extremes.
Quality of Work	Can you trend off Track-Walking Data?	Trending is hard to do – the data is too poor in quality.,
Quality of Work	How can we improve Optram for Track Inspection Purposes?	- For each maintenance manager (jurisdiction over geographical area/line), a swimlane displaying just his/her defects and priorities. - Performance Issues – Insufficient hardware and accessibility for Optram. Doesn't run in all browsers. - For geometry data, a simple key indicator as an agency would be useful: Number of Defects vs Number of Defects One (1) Year Ago. - Using the TGV as a primary tool to direct track inspectors, as opposed to being merely secondary in purpose. - Using wayside RFID (perhaps at stations) to accomplish dead-reckoning - Comparing Wide Gauge from Holland vs. TGV

Quality Assurance, Internal Compliance & Oversight
Interview Notes

QICO PROGRAM	Track Inspection Audit				
LOCATION	Alexandria Yard (C99) Large Conference Room	DATE:	3/9/2017	TIME:	10:00 – 11:00

Background Information		
[redacted]	TGV Data Analyst (Track Engineer)	MOWE:Track Engineering
[redacted]	TRST Software Support Analyst	Track and Structures (TRST)
[redacted]	TGV Manager	MOWE:Track Engineering
[redacted]	Auditor	QICO:Infrastructure Assurance
[redacted]	Auditor	QICO:Infrastructure Assurance

Interview Notes

Category	Question	Response
Definitions	What is **raw data**?	For all parameters (alignment, gauge, etc), foot-by-foot raw data has two (2) represented formats: **comma-separated-values (CSV)**, with 30-40K rows of data for a given section, and **video strip chart (VSC),** which are graphic images of raw data. This is generated by proprietary software on-board the TGV, but is displayed in a pdf for general consumption). UT Data is handled differently - A different file format - more like a video.
Definitions	What is an **exception**?	Anything outside the threshold. The standard thresholds are established by the WMATA – 1000 and manually edited on the TGV on-board computer. This information is stored in a "threshold file." The third rail system has a separate threshold file, as it was a custom system added to the TGV (most railroads do not use third rail).
Background	How are exceptions handled?	**On-board:** data is displayed with a delay of 600-ft (speed varies so the delay time may vary). The onboard technician inputs the known exception (frogs, switch points, etc,) and deletes the exception from the exception record, but not from the raw data. Note that the **TGV Data Analyst** will review the exceptions to confirm the designations of exceptions vs false-positive.

Background	How much does the on-board software edit versus human editing?	Little to none – it only generates exceptions. As an example, there are two (2) types of wide gauge standards for track: curved and tangent track. For this scenario, speed tables are uploaded to the TGV, but curve tables aren't uploaded. This means that the onboard team is relied upon to determine the severity of the wide gauge.
Processes	What are the primary responsibilities of each member of the TGV "data validation" team? Is there overlap with the on-board team?	WMATA's two-gauge issue (curves over and under 1425'): On-board team (TGMS technician) uses a curve chart and denotes exceptions. This function is necessary because the chase unit following the TGV needs to remove black conditions detected during the run - the on-board crew needs to confirm that these conditions are indeed black. They don't really focus on reds or yellows, as these are not out of service conditions. The TGV Data Analyst (post-run) completes a more thorough analysis to prune false positives or de-escalate conditions (blacks that are reds). Focus is on anything requiring speed restriction or black condition (OOS). Major issues are field-verified by Track Engineers (MOWE) or Track Inspectors under Assistant General Superintendent of Track Maintenance (TRST). Distribution to all Superintendents. The TGV Data Analyst also cross-checks the exception data with raw data off the TGV to verify that the TGMS is correctly identifying exceptions (6.8.3). The TGV Data Analyst hands his altered file to the Senior Software Support Analyst, who verifies the proper format of the file for uploading into Optram (separate service). Gauge is always raw data (other swimlanes as well). Defect swim lanes are not necessary raw (data comes from TGV Data Analyst). Removing pre-run junk data as the TGV is staging to the beginning of the run.
Processes	What challenges are there to ensure that the data for the TGV is valid and reliable for maintenance departments to use?	"Going back" to remove Black Defects requires stopping the TGV at a whole Chain Marker (CM), pausing the software, go back to fix/analyze the issue, rolling back to the denoted whole chainmarker (+00) and continuing on with the run. If this isn't done, right, the run data can be overlapped/defective. Thermoflex (pressing the button at chainmarkers) must be used more in areas with higher curvature, as wheel slippage creates errors in accurately measuring TGV positioning. Equation Changes are a big issue (thermoflex at the equation change required). Senior Software Support Analyst has to either cut out (equation roll-back) or flatline (equation jump-ahead) the data as displayed in Optram (potential loss of data or apparent "lack of data"). Ensuring that TGV runs in the usual direction of traffic flow. (Outbound on Track A1 vs Inbound on Track A1). Prime example is right rail, left rail transposing when Senior Software Support Analyst receives data for uploading to Optram. (TGV has a

		defined Front and Back, and must know its orientation of the front of the vehicle with regards to normal direction of travel.)
Work Order Management	Are work orders created automatically as a result of TGV activities?	Black conditions - work orders are created on the fly during the TGV run. Other work orders are the responsibility of Track and Structures.
Record Storage and Retention	Where are the TGV runs stored? How large are the files? How long are the records kept?	TGV Crew transfers using Hard Drives (never been a huge hangup in the data-upload and validation process). IT is pursuing Wi-Fi upload at Alexandria Yard, but the signal quality is bad. IT issues with access and storage 28 GB/track/run (compressed) K98- N06. Due to shared drive issues, data has been stored on multiple external hard drives. The goal is to have only Raw Data stored on a shared network drive with read-only access (with certain superusers granted write access). 5 years of historical data is required for storage purposes; IT has recently allocated 10TB of storage. Insufficient privileges (script writing) and computing resources (server speed) for Optram's computing requirements.
Technical Specifications	What sort of instructions are there for guiding future analysts for properly post-processing TGV data?	Contractor manual for uploading to Optram.
Other	How does TGV test Yard Track?	Separate files for Loop and Ladder Tracks. Not uploaded in Optram, as there is no chainmarker standardization and many different tracks. Same condition for mainline special trackwork. No appropriate way to visualize the data at the moment.

Quality Assurance, Internal Compliance & Oversight
Meeting Agenda and Attendance Roster

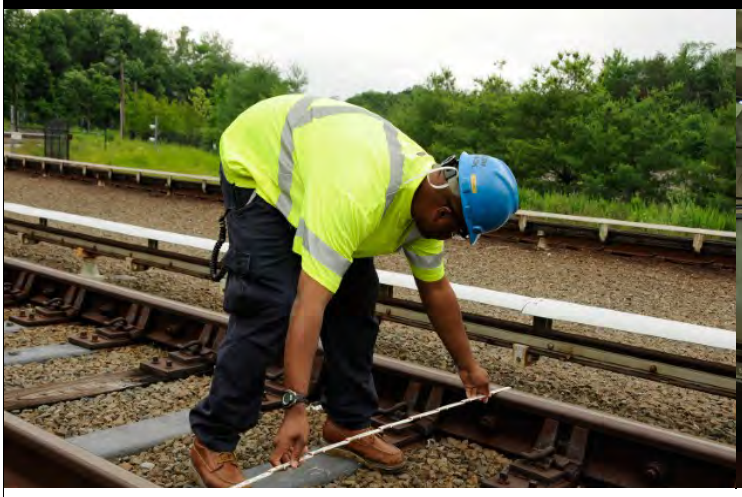
QICO PROGRAM	Track Geometry Vehicle & Track Walking Kickoff Meeting				
CALLED BY	QICO Infrastructure Assurance	DATE:	2/3/2017	TIME:	1300-1350
LOCATION	Alexandria Yard (C99) Glass Room (TA-40)	CONF. CALL #:	-		

CHALLEGES/WHAT WERE THE ISSUES?		
Item #	Topic(s)	More Information
1	Track Walking Inspection Process Changing	"Track walking processes are changing significantly in the next few months – why are you conducting the audit now, considering that (February-March)? Are you aware that track walks are presently being conducted by consultants/contractors? Can you move the audit back?" *This is one audit of a larger system-wide audit (railcars, track, facilities, etc). The documentation that we produce will reflect both the current state of affairs with trackwalking/TGV as well as remark on the proposed changes to processes and management structure. This audit will provide considerable value to the Authority by showing outside stakeholders (e.g. FTA) that we have effective independent assurance and oversight.*
2	Ultrasonic (UT) Testing with TGV	It would be best to shadow TGV UT runs within the **next week (February 6 – 10)**. The TGV is slated for routine maintenance after next week before conducting mainline track inspections.
3	Submitting Documentation	A list of the documentation (DRAFT) for TGV and Track Geometry is attached. Please provide any pertinent documentation not already listed to QICO_Infrastructure_Assurance_Program@wmata.com

ATTENDEES:	Please Write Clearly and Eligibly		
NAME:	DPMT.	E-MAIL	SIGNATURE
[redacted] (Coordinator)	QICO	[redacted]	Present
QICO QMA Team	QICO	QICO_Infrastructure_Assurance_Program@wmata.com	Present
[redacted]	TRST	[redacted]	Phone
[redacted]	CENI:TSFA	[redacted]	Phone
[redacted]	CENI:TSFA	[redacted]	Present in Meeting
[redacted]	CENI:TSFA	[redacted]	Present in Meeting

(Attachment on next page)

SECTION 3 - WALKING TRACK INSPECTIONS AND TRACK GEOMETRY VEHICLE (TGV)



Metrorail Track is inspected daily by a 50-man team of walking track inspectors (track walkers) and periodically by the Track Geometry Vehicle (TGV). In addition, joint inspections are conducted on all switches on a monthly basis, and various third party inspections are used in an auxiliary capacity for maintenance planning. This audit will assess the effectiveness of the methods and timing of said inspections, and verify compliance with established internal procedures and applicable industry standards.

PLAN OF ACTION (KICK OFF MEETING)

Item	Topic(s)	More Information	Deliverable
1	Overview	- **Deadline:** Final Draft March 15, 2017, Post-Audit Review March 16, 2017, Submission March 17, 2017 - **Staff Required**: One (1) WMATA QA Officer with One (1) subject matter expert (Staff Augmentation) - **Time Required**: 240 hours to conduct document review, conduct interviews, shadow field inspections, and generate report with findings and required actions	Comprehensive audit of TGV and Walking Track Inspections, with Required Actions and Plans for Follow-up to ensure action is undertaken
2	Conduct Review of Background Literature	- **Policy and Procedures:** OAP 114-01 TGV Inspection Policy and SOP 114-01 TGV Inspection Procedure - **Operations Manuals:** TGV Operation and Maintenance Manual (ENGR-MANL-0000078) - **Standard Documents:** WMATA-1000 Track Inspection and Maintenance Manual, any additional documentation in Standard Specifications, Drawings, Design Criteria, Work Instructions (WITK). - **Regulatory Findings:** Findings and Recommended Actions as defined in FTA Final Report – Track Integrity Investigation (August 8, 2015) - **Internal Findings:** Findings issued by internal oversight entities (OIG, QICO, SAFE) that generate recommendations. Previous QICO/QAAW reports on TGV, Track Walking (Q: Drive).	A matrix of findings (highlighting inconsistencies or deficiencies) and recommendations for improvement of standards governing TGV and Track Walking Inspections
3	Perform Field Assessments	- TGV Geometry Run (Usually conducted during the day) - TGV UT Test Run (Usually conducted at night) - TGV Geometry Calibration and UT Calibration - Mainline Walking Track Inspection - Joint Switch Assessment (ATC and TRST-TKIN)	Assessments for each of the major work process with findings and recommended actions.

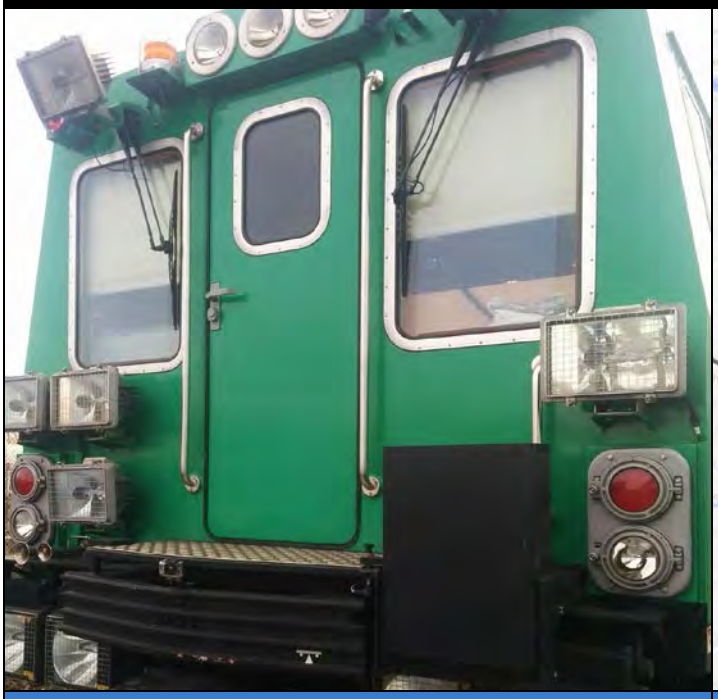
4	Business Processes and Record Keeping	- Paper trail from initial inspection to upload into repositories - TGV Data Collection, Validation and Trending in Optram (Ensuring that errors are minimized, whether false positives or negatives) - Track Walking Data in Optram - Previous track inspection defects and TGV reporting in Maximo/Optram	Process Diagrams and an evaluation of data validity and usefulness in Optram/Maximo.
5	Meetings with Maintenance Supervisors	- Superintendent of Walking Track Inspections (TRST:TKIN) - Supervisor of the Track Geometry Vehicle - Assistant Chief Engineer, Track Engineering (CENI:TSFA)	Completed questionnaires. Answers the question, "How does management use the data provided by the TGV or track inspectors?"
6	Additional Forms of Inspection (Time Permitting	- Ground Penetrating Radar (GPR) - Tie-Scanning Services (GREX) - Lateral Load Testing - Heat Rides, VERSE Testing and IRIS anti-buckling system - 7000 series TrackIT system	Addendum with summary of value added to the Authority by the addition of these services
7	Other Issues to Consider	(TBD)	(TBD)

8.9 APPENDIX J: QICO FIELD INSPECTION VISITS

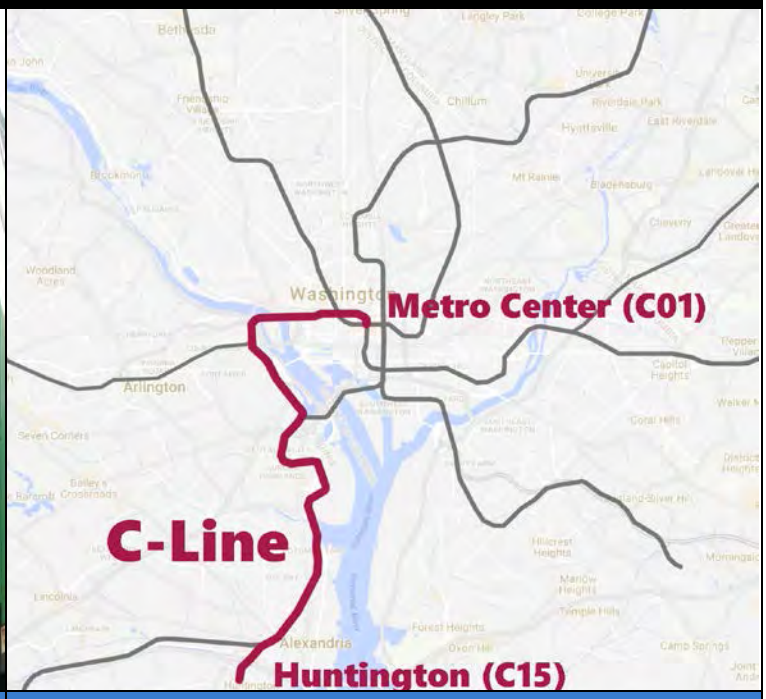
INFRASTRUCTURE ASSURANCE PROGRAM
QUALITY ASSURANCE REPORT

QICO FIELD TEAM	[redacted]	REPORT NO:	MS-20170303-01
AUDITEE	RAIL:MOWE (Maintenance-of-Way Engineering)	LOCATION:	C-Line (C1/C2 0+00 to 623+00)
ACTIVITY	Automated Track Geometry Inspection		
DATE	March 3, 2017 - March 4, 2017 (2200 – 0200)		

EXECUTIVE SUMMARY



Track Geometry Vehicle (TGV) (Generic Photo)



Map of Area Covered (Track C1 and C2)

PURPOSE

The infrastructure assurance team for **Quality Assurance, Internal Compliance and Oversight (QICO)** accompanied a **Track Geometry Vehicle (TGV)** inspection the night of March 2, 2017 (2200-0200). This was conducted as part of an audit of Metrorail track inspection (TGV and trackwalking inspection), which is in turn part of the **2017 QICO Systemwide Audit**. Performing these audits safeguards the mission success of the Authority by providing effective internal oversight of WMATA's operational processes and assets.

SCOPE

The TGV inspection focused on track geometry on Metrorail's C-Line, tracks 1 and track 2 (shown on map above). The type of inspection was mainline track geometry inspection (ultrasonic rail testing, another capability of the TGV, is scheduled separately). The TGV was staffed by four personnel other than the QICO auditor. The inspection started with a complete safety briefing; Radio Operations Control Center (OCC) granted permission to enter the roadway to begin its inspection runs and remained in communication with Operations Control Center (OCC) throughout the inspection. The TGV crew was required to stop for all detected black defects to verify and remove the track from service if necessary, submitting slow orders via radio upon verification.

RESULTS

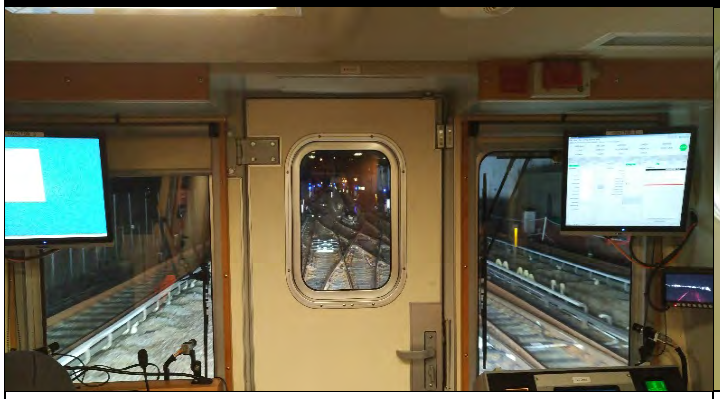
The inspection run flagged many gauge defects, most of which were disregarded due to natural gauge widening in curves (reflected by standards set forth in the WMATA-1000 Maintenance and Inspection Manual, *Table 11-2 Wide Gauge*). There were two defects of concern, for which the crew performed field verification. At C1 66+31, gauge was 57-1/4"; at C2 276+48 which read 57-5/16" both were verified ok. No slow orders were submitted and no black defects were noted. Note that the inspection did contain a portion of track which recently underwent a surge renewal and the number of gauge related defects was greatly reduced.

OBSERVATIONS	
Item Number	Observation
1	The TGV is manually calibrated periodically during the run by pressing a button; this leads to inconsistent defect locations. The TGV can be a very precise inspection tool, but if chaining is not accurate, the ability to compare defects between runs is limited, which can reduce the effectiveness of the inspections and limit longer term maintenance planning.
2	The TGV gathers large amounts of data (cross-level, gauge, profile, alignment, 3rd rail, head wear, and other physical infrastructure locations such as signal equipment), a majority of which is not utilized. Due to not having the TGV programmed with the required track information. This greatly reduces the effectiveness of each TGV run.
3	The gauge defects are reviewed manually and removed if not valid. This manual review slows the inspections, limiting the amount of track being covered within each inspection window.
4	Stopping the TGV causes breaks in the data, which makes it more difficult to compare runs with each other, shifting more work to the TGV post-run team (data analysts) to correctly display the data in Optram.
5	The speed of the TGV runs changes the amount of detail in the inspection data.

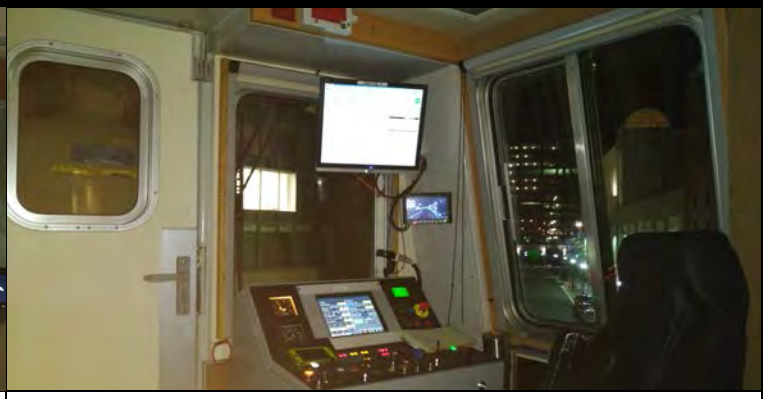
RECOMMENDATIONS	
Item Number	Recommendation
1	Utilize GPS, machine vision, RFID, or other automated methods to more precisely adhere to accurate chaining. (chainmarkers) This will allow for more uniform data collection, in turn allowing trends of defects to be generated. These trends can be used for longer term maintenance planning and better budgeting and outage utilization. This, coupled with more accurate chaining with manual track inspection will also allow the automated and manual inspections to be compared, resulting in a greater quality of inspections.
2	Program in the engineered track geometry so the TGV can process as many defects as possible for each inspection run. This will provide a more comprehensive picture of the infrastructure, allowing for better maintenance planning and increased overall safety because track crews will be able to maintain multiple infrastructure systems while working in a given area.
3	With the WMATA-1000 programmed into the TGV, the large amount of false defects (false positives) will be greatly reduced. For example, the certain wide gauge defects in curves would not show up on the track defect screen as red

	defects. This would allow for greater scrutiny of defects when they do appear as well as reduce the hold times at the end of inspection runs, allowing for more infrastructure to be inspected for a given inspection window.
4	Utilize infrastructure markers (as described in Recommendation 1) and software to reduce and remove the breaks in the data to allow inspection runs to be compared.
5	A more detail procedure to be in place to ensure consistent, accurate data is gathered.

ADDITIONAL PHOTOS

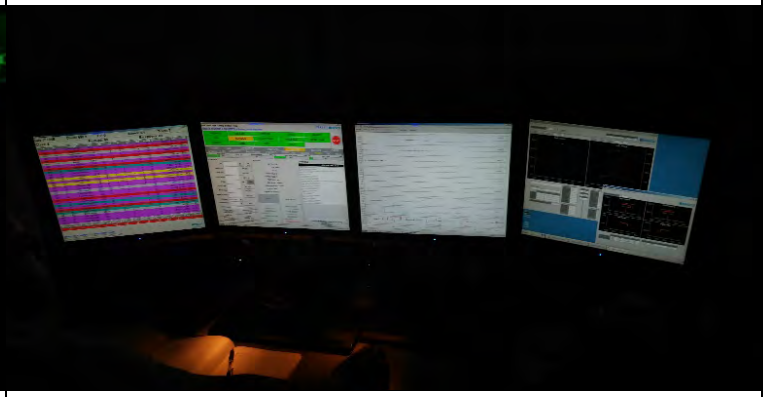


View from the TGV Cab

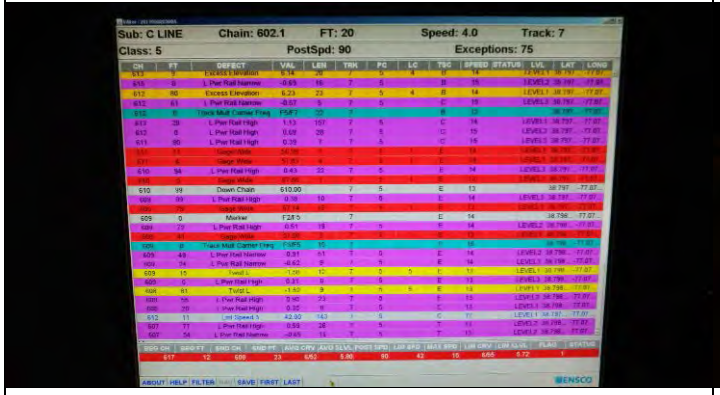


View of the TGV Control Center

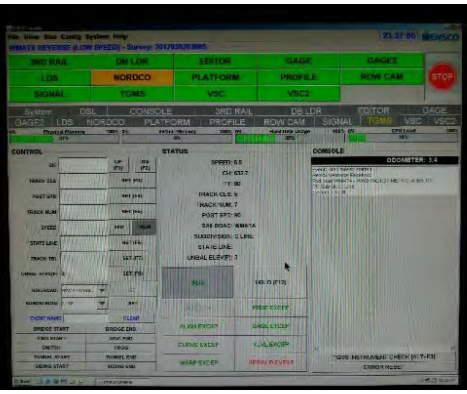
View of the TGV Driving Panel



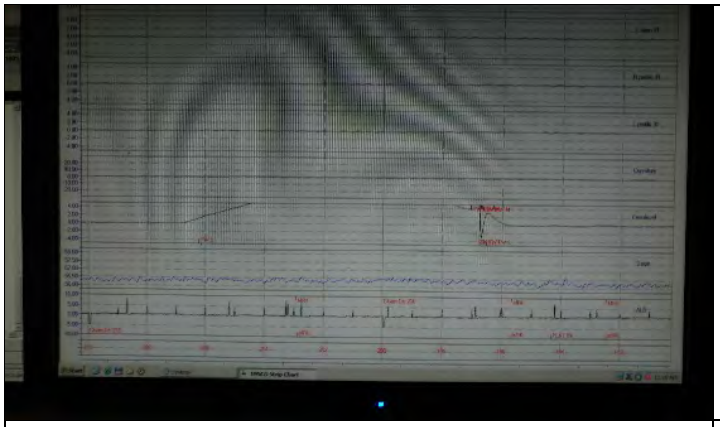
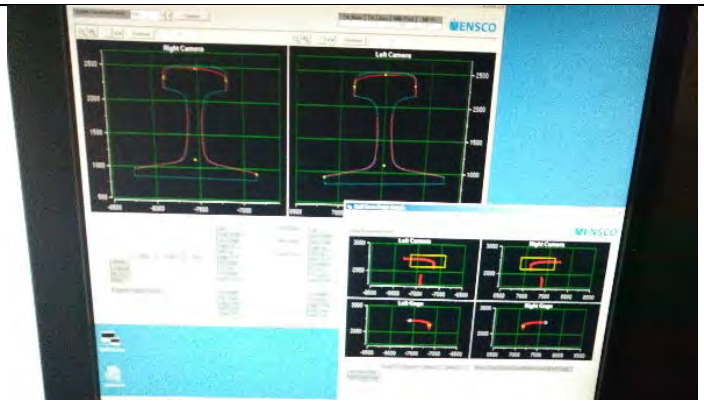
View of the Track Defect Analysis Center



Close-up View of the Track Defect Screen



Close-up View of the TGV Inspection Controls

	
Close-up View of the Video Strip Chart (VSC)	Close-up View of the Head Wear Analysis Screen

PREPARED BY:	QICO OFFICER	

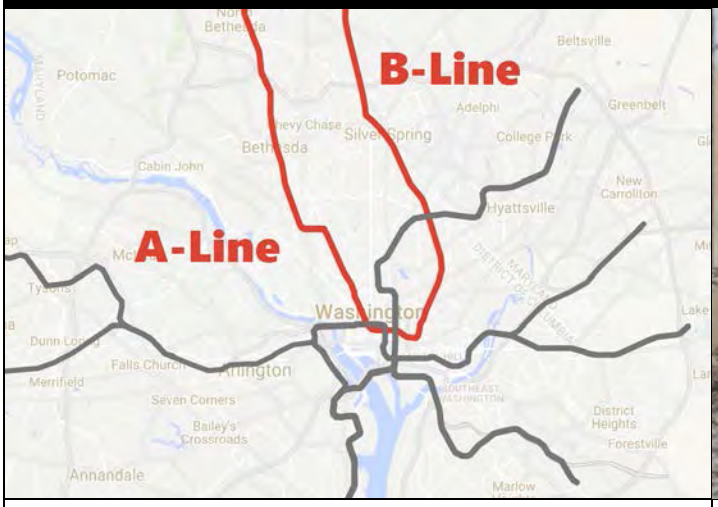
APPROVED BY:	QICO MANAGER	

INFRASTRUCTURE ASSURANCE PROGRAM

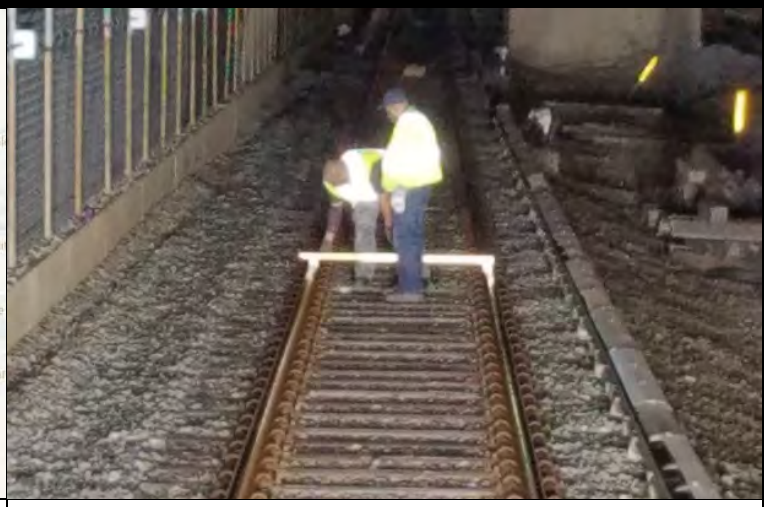
Track Geometry Vehicle (TGV) – Track Geometry Run

Report Date: 3/13/2017

EXECUTIVE SUMMARY



Measuring Narrow Gauge (03/09/17) – Photo 1



Measuring Narrow Gauge (03/09/17) – Photo 2

On March 9, 2017, the Track Geometry Vehicle (TGV) preformed geometry testing on Track 1, from Shady Grove (A15) to Glenmont Station (B11). The testing focused on evaluating the track profile, cross leveling, height of third rail, and gauge.

KEY FINDINGS

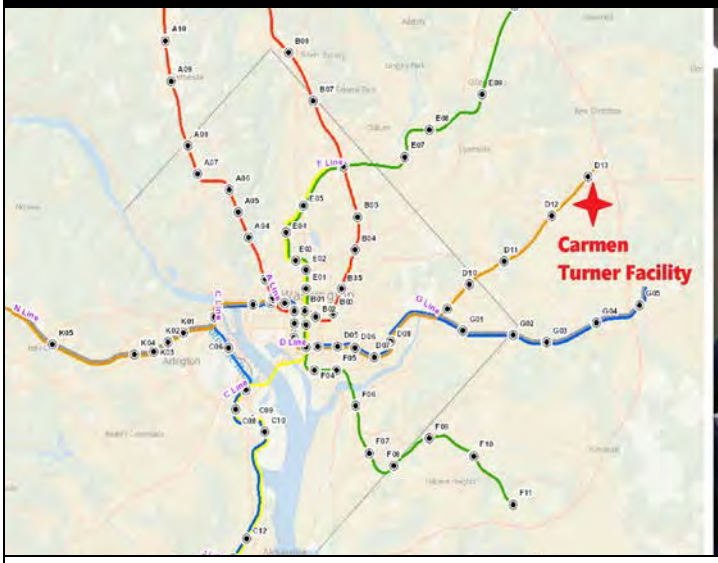
Item Number	Finding
1	- A narrow gauge of 55.77 inches was reported at 569+90 at the switch point. The location was in the tunnel prior to the Grosvenor-Strathmore station on direct fixation track (Photo 1). This condition was determined to be a black condition. There was a maintenance of way representative participating in the inspection that verified the measurement and the track was taken out of service. The switch was scheduled to be worked on during the evening of the inspection.
2	- A narrow gauge of 55.87 inches was reported at 285+91. The location was on ballasted track. (Photo 2). The gauge was field verified at 56 inches and deemed acceptable. No slow orders were added to this section of track.

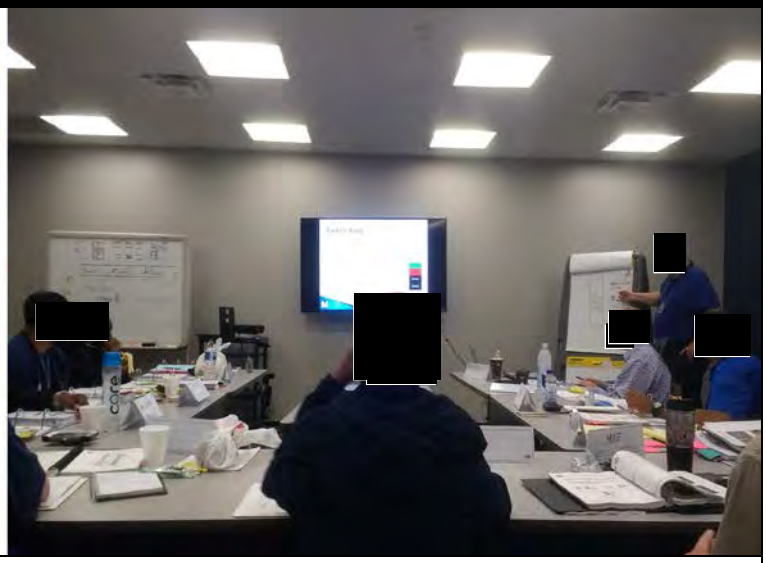
REQUIRED ACTIONS

Item Number	Finding
1	Track Engineering and QICO should follow up on the repair of the switch at 569+90 and confirm the width of the gauge to determine if it is within acceptable limits.

PREPARED BY:	QICO OFFICER	Kim Gilbert (HNTB)

SUMMARY





March 28th Audit of WMATA Initial Track Inspector Training

For the System-wide Infrastructure Audit 2017, the infrastructure assurance team for the Office of Quality Assurance, Internal Compliance and Oversight (QICO) shadowed the "WMATA Initial Track Inspector Training," conducted by K&J Safety and Security Consulting, at WMATA's Carmen Turner Facility (CTF). The 6-week class was created as part of a restructuring of WMATA's walking track inspection program in response to a revenue train derailment at the double crossover at East Falls Church on July 29, 2016. The class is designed to assume attendees have little or no track inspection experience.

There were ten attendees:

- Division Superintendent, Track Maintenance and Inspection (1)
- Track Inspection Supervisor (2)
- Track Walker AA (2)
- Track Walker A (1)
- Track Walker B (1)
- Track Walker C (1)
- Rail OPMS Tech Skills Training Instructors (2)

The morning portion of the class on March 28, 2017 focused on switch inspection standards, which are critical trackwork components for WMATA's special trackwork (such as the East Falls Church double crossover). The supporting audio-visual material displayed standards in WMATA-1000's Track Maintenance and Inspection Manual (TRST-1000); each attendee followed along in a personal copy of the WMATA-1000. Most, if not all, of the diagrams and pictures in the material were photos from WMATA Metrorail's system. The class instructor supplemented the discussion by drawing movement of safety-critical components on an easel pad.

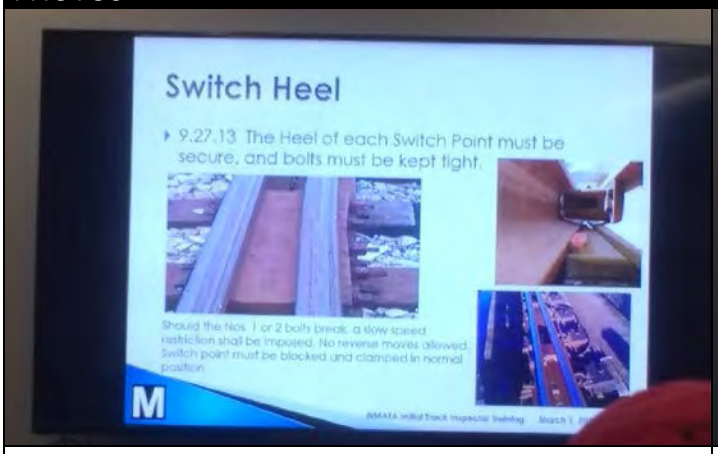
Module 3-2 (0700 – 0845) - Switch Points, Stock Rails, Switch Plates, Operating/Connecting Rods, Rail Anchors, Rail Braces, Switch Heels – Bolted and Floating.

Module 3-2 Demonstration (900-945) - Demonstration at CTF Room B122 on full-scale model of turnout. Instructor covered visual inspection procedure for switch point wear, bolts on switch rods.

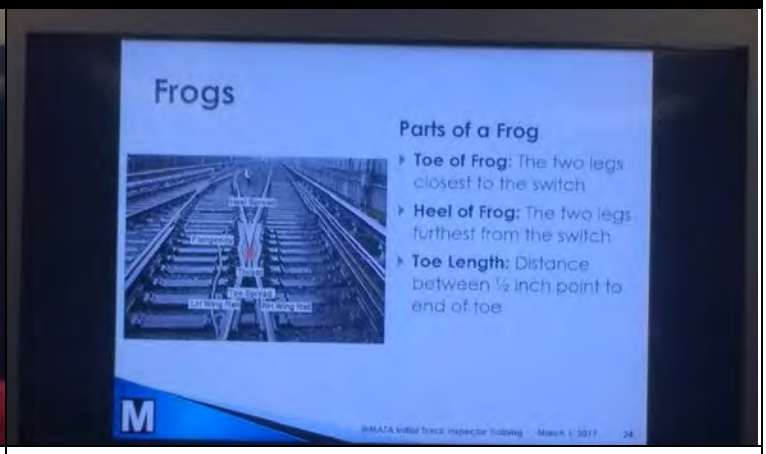
Module 3-3 Frogs (1000-1100) – Overview of frog terminology (tread, point, flangeway, wing-rail, binder rails, etc).

The afternoon portion, which covered guardrails and diamonds, was not attended by QICO.

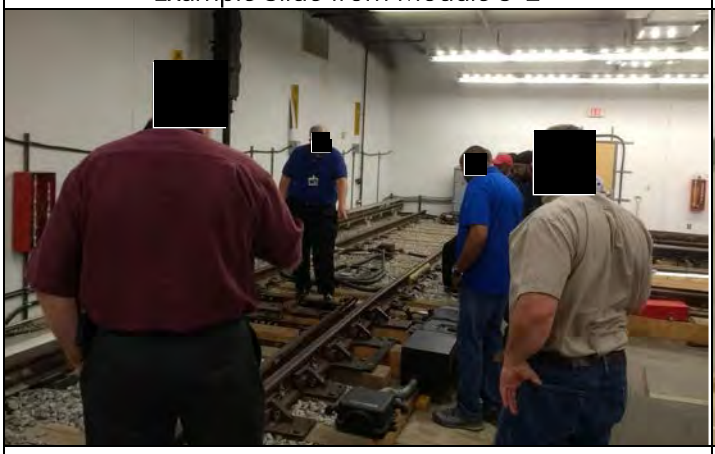
PHOTOS



Example Slide from Module 3-2



Example Slide from Module 3-3



Full-Scale Demonstration on Turnout Inspection (B122)

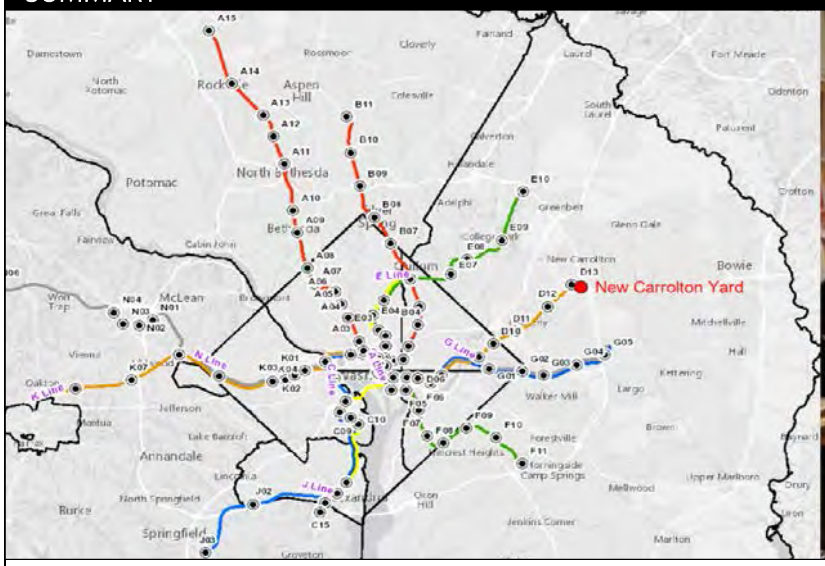
Explaining the Importance of the First Bolt on the Heelblock

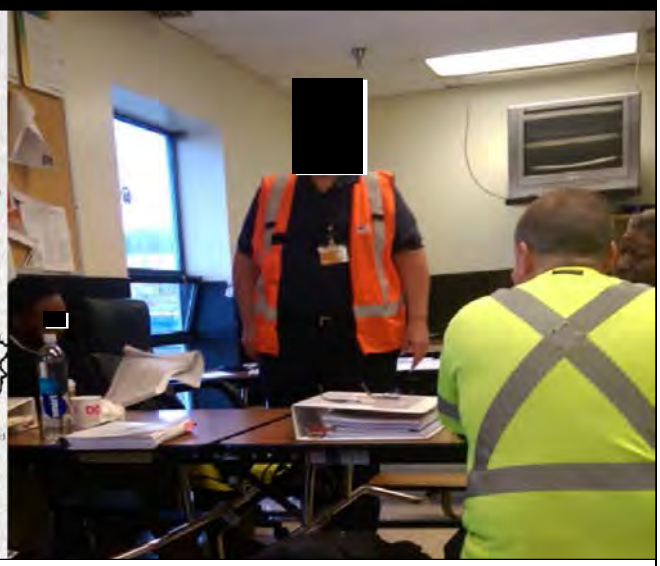
KEY OBSERVATIONS

Item	Observation	
1	Coverage of the standards set forth in the WMATA-1000 was comprehensive.	A significant amount of the classroom material was structured by displaying a particular standard in the WMATA-1000 and discussing the tolerances, why the standard is important, and how to measure the standard in the field. An example:

		"9.27.14 Switch Machines/Stand and connecting rods must be securely fastened and operable without lost motion."
2	The instructor was professional and knowledgeable.	The lead instructor actively engaged attendees both in the classroom setting and the demonstration performed in the full-scale special trackwork lab.
3	Track Inspectors were familiar with the material covered, though not familiar with the some of the intricacies expounded by the instructor.	The track inspectors were attentive and actively participated in the classroom. The inspectors clearly demonstrated technical literacy and awareness of most of the issues discussed; certain details (e.g. crack propagation through manganese steel frogs, or classifying defects as speed-restriction-worthy) required the expertise of the instructor. Inspectors actively identified discrepancies in the WMATA-1000 and the (e.g. difficulty measuring frog flangeway Depth, WMATA-1000 9.22.1).
4	There are solid discussion points that should be incorporated into the upcoming revision of the WMATA-1000.	Through observation of in-class discussions and conversation with the classroom instructor and division superintendent also attending the class, the class is serving as an in-depth discussion on the WMATA-1000 (for TRST). Discrepancies or omissions identified in the class should be discussed with the Assistant Chief Engineer, Track Engineering (under Maintenance-of-Way Engineering MOWE) for inclusion in the upcoming revision of the WMATA-1000. Note that Track Engineering is the custodian of the governing document for Track and Structures (TRST).

SUMMARY





For the System-wide Infrastructure Audit 2017, the infrastructure assurance team for the Office of Quality Assurance, Internal Compliance and Oversight (QICO) shadowed the "WMATA Initial Track Inspector Training," conducted by K&J Safety and Security Consulting, at WMATA's Track Maintenance Facility within New Carrolton Yard (D99). The 6-week class was created as part of a restructuring of WMATA's walking track inspection program in response to a revenue train derailment at the double crossover at East Falls Church on July 29, 2016. The class is designed to assume attendees have little or no track inspection experience.

There were ten attendees:

- Division Superintendent, Track Maintenance and Inspection (1)
- Track Inspection Supervisor (2)
- Track Walker AA (2)
- Track Walker A (1)
- Track Walker B (1)
- Track Walker C (1)
- Rail OPMS Tech Skills Training Instructors (2)

The purpose of today's class was to conduct a practical examination of both a turnout and frog inspection. This follows up with the classroom session on 03/28/2017 giving the track inspectors practical hands on experience to apply the lessons learned in class. Safety PPE equipment was required by all participants attending.

Morning Introduction and Recap (0700 – 0821) – Instructors provided an initial morning safety briefing including designated place of safety in case of emergency, defibrillator location, CPR certified personnel, safety rule of the day, and bathroom locations. The safety rule of the day was be awake and alert.

Following the safety briefing a recap of material covered the previous day was conducted. Material reviewed included: manual switch vs electric switch, carbon steel, manganese steel, frogs, guard check vs guard face, turnout bolts, heel block pumping, switch rods, off set measuring, horizontal cracking at switch point, rail movement, and other turnout/frog material.

Field Visit (0821-1140) – After a full safety briefing was conducted by TRST 70, the class made their way through the welding shop to a stack of frogs located behind the building. Following a review of frogs the class continued to the turnout at the end of the shop apron to conduct a turnout inspection.

KEY OBSERVATIONS		
Item	Observation	
1	The instructors were professional and knowledgeable.	Instructors were open to questions throughout any portion of the class. Questions were provided an answer immediately proving the instructors were very knowledgeable in track inspections. A positive learning environment was provided by instructors and appeared to be very effective and informative.
2	Track inspectors participated in hands-on activities performing frog and turnout inspections.	All track inspectors performed measuring of different components throughout the frog and turnout areas. When unsure inspectors asked various questions to problem solve the measurement.
3	Track inspectors showed signs they were not familiar with turnout and frog inspections.	Track inspectors are required to conduct monthly turnout inspections. It was made apparent many track inspectors are not familiar with certain component names or where to properly take the measurements. This class is designed to assume all attendees have little to no track experience, however, all attendees in this class have been track inspectors at WMATA. This issue shows a cause of concern for the validity of inspections and in particular turnout inspections.
4	Turnout inspection form discrepancy.	Among the track inspectors there was some discrepancy which forms were used to fill out turnout/switch inspections.

PHOTOS

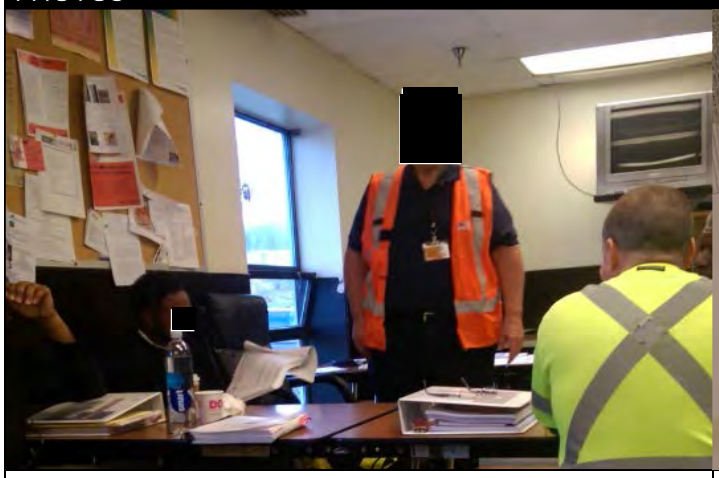


Figure 1: Morning Introduction
(Date: 03/29/17 Time: 0726)

Figure 2: Bolt Comparison of Old vs. New Style
(Date: 03/29/17 Time: 0753)

Figure 3: Explanation of Turnout Design Drawing
(Date: 03/29/17 Time: 0754)

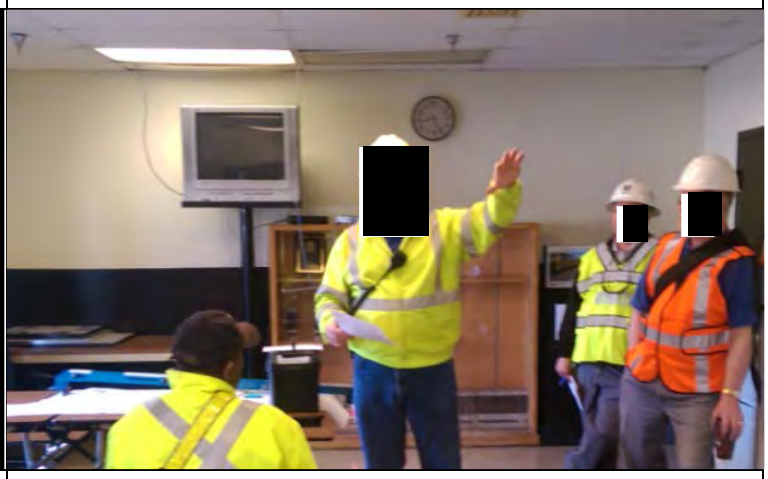


Figure 4: Safety Briefing
(Date: 03/29/17 Time: 0825)

Figure 5: Welding Shop
(Date: 03/29/17 Time: 0832)

Figure 6: Riser Wear Measurement
(Date: 03/29/17 Time: 0844)

Figure 7: Flange-way Depth
(Date: 03/29/17 Time: 0851)

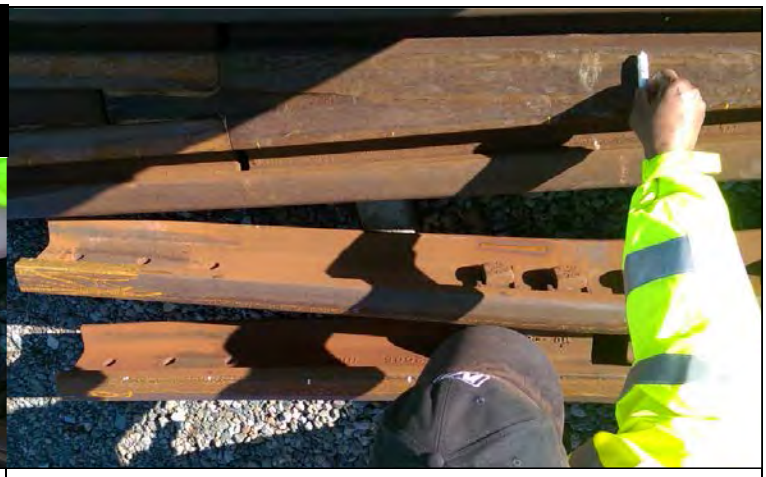


Figure 8: Frog Sizing
(Date: 03/29/17 Time: 0924)

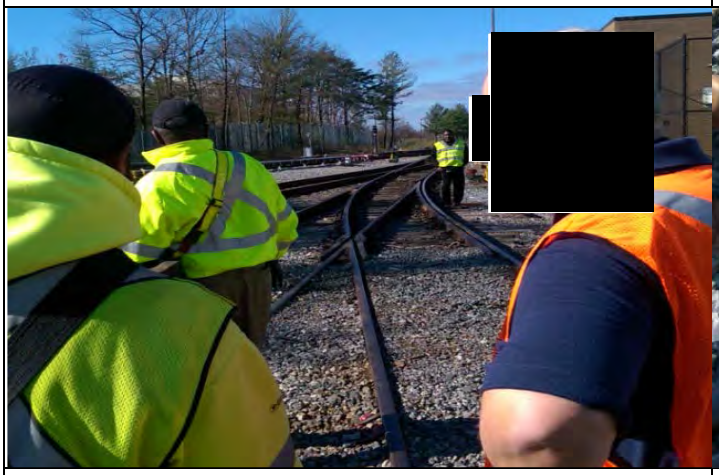


Figure 9: Sight Down Rail Curve Lead
(Date: 03/29/17 Time: 0930)

Figure 10: Guard Rail Opening Measurement
(Date: 03/29/17 Time: 0934)

Figure 11: Guard Face Gauge
(Date: 03/29/17 Time: 0937)

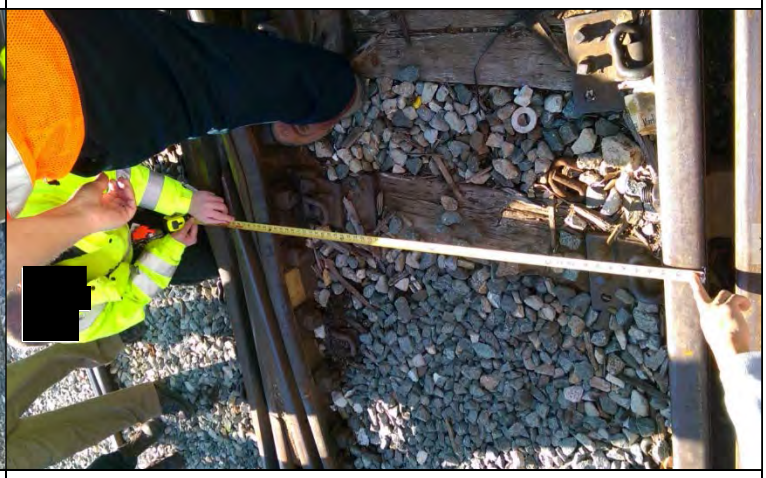


Figure 12: Guard Check Gauge
(Date: 03/29/17 Time: 0938)

Figure 13: Cross Level
(Date: 03/29/17 Time: 0955)

Figure 14: Explanation of Switch
(Date: 03/29/17 Time: 1006)

Figure 15: Hand Throw Switch
(Date: 03/29/17 Time: 1015)

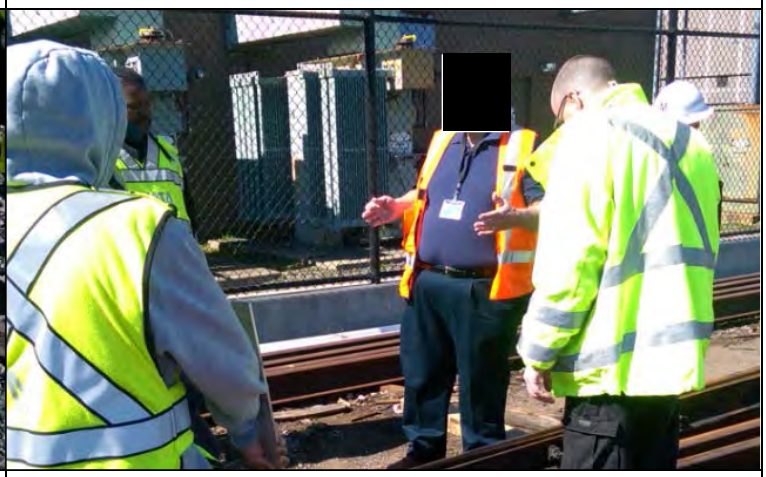
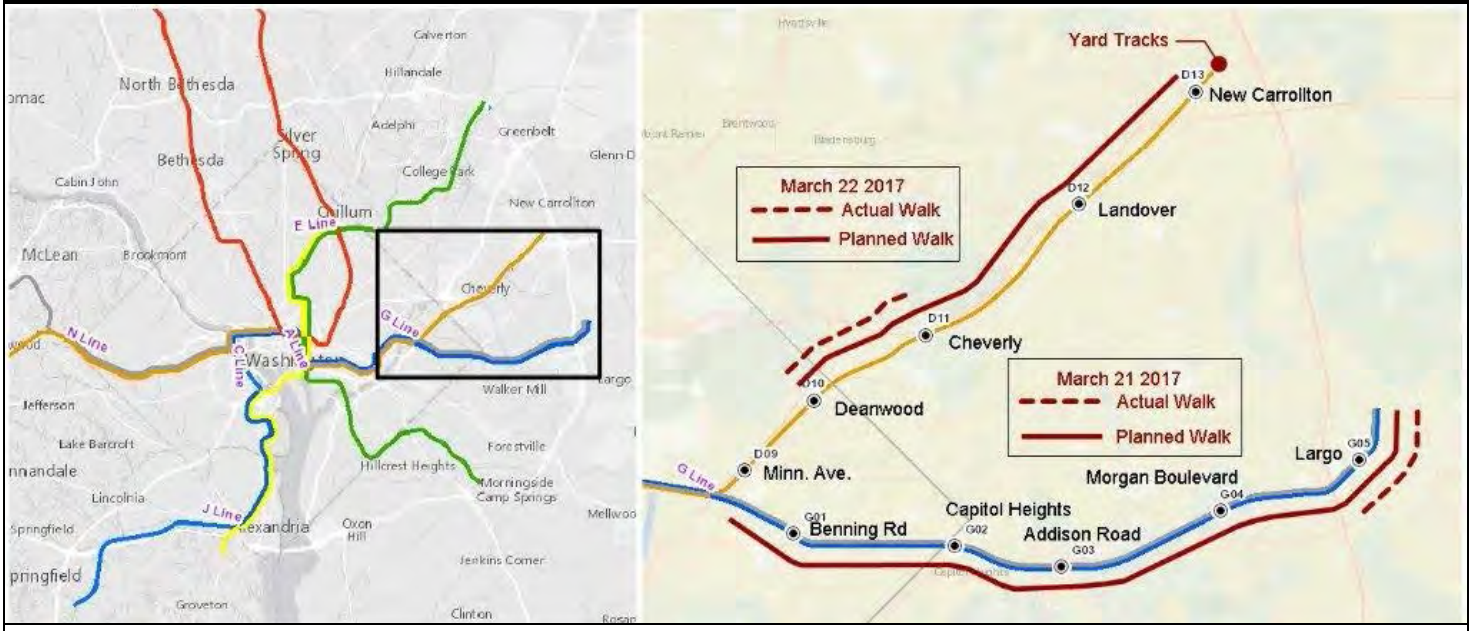


Figure 16: Explanation of Switch Point
(Date: 03/29/17 Time:)

EXECUTIVE SUMMARY



March 21st, 2017 Inspection (G-Line) and D-Line March 22nd, 2017 Inspection

For the System-wide Infrastructure Audit 2017, the infrastructure assurance team for the Office of Quality Assurance, Internal Compliance and Oversight (QICO) conducted a procedures inspection of the Walking Track Inspectors for the days of March 21st and March 22nd, 2017.

The inspection involved shadowing track inspectors and observing the inspection of ballasted track, direct fixation track, and turnout inspections, as well as their utilization of the Authority's maintenance management software MAXIMO. The March 21st inspection was planned to consisted of mainline track on the G-Line Track 1 from Largo to Benning Road (Sta. 655+23 to 339+41). Due to time constraints caused by a track defect and resulting speed restriction the inspection was unable to continue past Sta. 610+00. The March 22nd inspection consisted of two parts: yard switch inspection and mainline track inspection. The yard switch inspection consisted of two switches in the New Carrollton Yard; the switches inspected were 165 and 167. The mainline inspection was planned to consist of the D-Line Track 2 from Deanwood to New Carrollton (Sta. 362+32 to 611+26). Due to time constraints caused by a track defect and resulting speed restriction the inspection was unable to continue past Cheverly Platform.

The following report details QICO's observations and recommendations.

Summary	
Date	Background
March 21st 2017	QICO accompanied a Class C Track Inspector on the G-Line from Largo to Benning Road on Track G1. The Inspector was met by an inspector from another yard who would perform as the RWIC.

KEY OBSERVATIONS		
Item Number		Observation
1		Platform Inspection
	a	The walk began at the platform. The inspector informed that foul time must be called in order to inspect the platform track because there is no clear area (clearing under the platform is only to be done in an emergency situation so does not remove the need for foul time). This lead to inspecting only from the raised platform on a regular basis.
	b	Where this may be sufficient in some circumstances this should not be the regular method of inspection. It is difficult to see the field side of the far rail and its fasteners.
	c	A defect (missing clip) was noted on the visible portion of the track during the platform observation on the observable field side.

PHOTOS

Largo Platform

Missing Clip at Largo Platform

KEY OBSERVATIONS		
Item Number		Observation
2		Interlocking Inspection
	a	Once the RWIC received permission to the group to enter the right-of-way (ROW) the inspection proceeded through the interlocking at signal G05 to G06. The interlocking in Track 1 including the diamond was inspected for a recent repair the inspector had request as well as a brief pass looking for other defects.
	b	The Control Center radioed to see when we would be clear of the interlocking before and again during the interlocking inspection providing a sense of urgency during the inspection that led to an overly rushed inspection which prevented a full inspection of all the rails and fasteners.
	c	It is important to note that inspection of gauge and a more detailed inspection of the rails and fasteners is performed once a week, this is due to the reduced number of track inspector available to perform the walks, leading to only a two-person crew for normal inspections. This means that the inspectors do not have the sufficient manpower to inspect mainline switched fast enough during the revenue service.

PHOTOS

Mainline Switch as G05

Missing Anchor Bolt

Rail Head Fatigue

Rail End Batter

KEY OBSERVATIONS		
Item Number		Observation
3		Direct Fixation Track Inspection
	a	A rail head shelling/end batter defect was noted but after measuring did not require a speed restriction.
	b	The walk proceeded over the aerial structure headed to the tunnel portal. At this point, numerous defective fasteners were found in a row, leading to 120" between fasteners. The inspector checked the pocket manual which confirmed this condition qualifies as a red condition.
	c	The inspector notified the RWIC who radioed Rail Operations Central Control that a slow order needed to be put into effect. The inspector gave the chaining of the defect and 600-ft before and after the defect to the RWIC and the slow order was put in place.
	d	The inspector then called his supervisor, who did not immediately respond. A few minutes later the RWIC called the supervisor and supervisor was reached. The inspectors were instructed to wait for someone to come and verify the defect.
	e	The inspector called MOC and notified them of the defect. There was apparently a slight miscommunication as the MOC did not request a maintenance crew to come out at that time and the inspector did not request it either. The supervisor reported he had been contacted by MOC but they had not notified him or request of him that a crew be sent out. This led to a delay of more than one hour where the RWIC and inspector were not able to continue the inspection due to waiting on a crew. The supervisor was then contacted again and the situation was cleared up and a maintenance crew was sent to the defect location.
	f	The defect was mostly caused by anchor bolts coming out of the concrete inserts leading to loss of proper rail restraint. The defect was explained to the maintenance crews; however, a detailed breakdown of the situation was not provided, leading to the crew not bringing a hammer which proved to be a required tool to fix the defect enough to lift the speed restriction. The inspection team then waited for the crew to retrieve a hammer. The maintenance crew did work on repairing other defects while waiting on the hammer but some delay was still apparent.
	g	A cleaning tool such as a pipe brush would have also been helpful to clean out the inserts but was not available so QICO produced a plastic pen which was used to remove enough dirt and grime to thread the anchor into the insert.
	h	In observing the repairs conversation between the QICO inspector and the maintenance supervisor over the length of the bolts resulted in the conclusion that the original bolts as well as the bolts used in the repair were of an insufficient length, often resulting in only a few threads of the bolt engaging the insert.
	i	The crews used a T-bar socket wrench to tighten the bolts; however, no torque wrench was used to ensure the anchor was torqued to the required 300 ft-lbs.
	j	QICO recommended utilizing longer bolts to provide better hold reducing the anchors propensity to vibrate out because they could be properly torqued and there would be more threads in the insert, and as they did loosen over time the anchor bolt would at least remain in the insert, making it quicker and easier to torque by preventing the need to reinstall the bolt and preventing the insert from filling with debris. The maintenance supervisor stated longer bolt were not made so are unavailable. It is important to note that upon returning to Alexandria Yard QICO spoke with Track Engineering and they produced a longer bolt.

PHOTOS

Missing clips and anchor bolts (RED Defect)

Concrete inserts for anchor bolts

Short anchor bolts (Min 3.5" bottom of head to end)

Rail end batter, 0.25" deep, (YELLOW Defect)

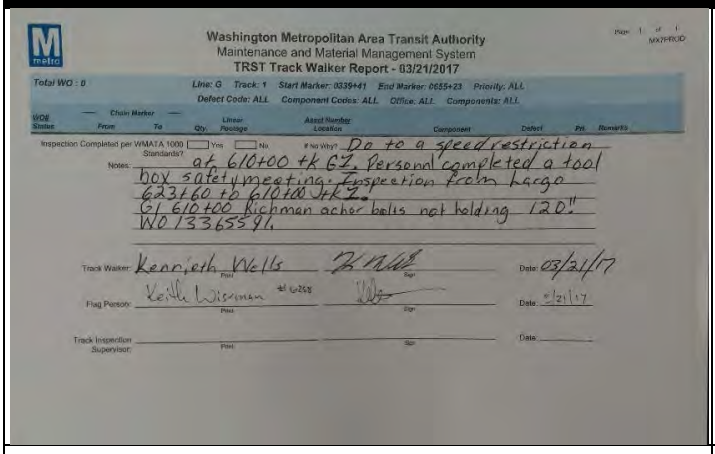
KEY OBSERVATIONS		
Item Number		Observation
4		End of Inspection
	a	At 2:30 pm the RWIC called the inspection off and requested a train pick up.
	b	The RWIC, track inspector, and QICO returned to the station by train in order to avoid walk in the direction of train travel.
	c	The maintenance crews were still repairing defects when the inspectors left the site.

PHOTOS

Maintenance Crew Completing Repairs

KEY OBSERVATIONS		
Item Number		Observation
5		MAXIMO
	a	After returning to the yard the inspector began to fill out the daily inspection report. QICO observed that this done both manually and in MAXIMO. Upon inquiring the inspector stated both are required.
	b	After completing the manual inspection report and speed restriction form, the inspector began entering data into MAXIMO, he spent quite a few minutes trying to align the observed defects with defects already in MAXIMO, he informed QICO that inspectors use to take a printout of the database with them so could note updated to defects while in the field but they are no longer allowed to bring it with so must reconcile defects once back at the office.
	c	The inspector did not appear to be completely comfortable with MAXIMO which made the process slower.
	d	After updating the defects QICO inquired as to how the defects get removed from MAXIMO after they are repaired. The inspector stated he would review the repairs upon his next walk and updated MAXIMO that the defects are no longer defects, that the work order produced by MOC would separate from the defect work order the inspect produced because the MOC work order was created from radioing in the slow order, not from the defect work order in MAXIMO.
	e	It is important to note that upon speaking with the inspection supervisor the follow day QICO received more detailed procedures. MOC's work order is a separate work order system and therefore does not automatically update the inspector walking defect database. However, the inspector should return the office and attach the defect work order to the MOC work order as a child then when MOC closes the work order the defect work order is removed. This did not work in the case from the previous day and at many other times because MOC was able to close the work order before the inspector returns to the office, which prevents the inspector from being able to attach the defect. This leads to "orphaned" work orders.
	f	The supervisor explained that for some time MOC requested inspectors mark these work orders as finished/closed and provide MOC with a list periodically so they could be removed but recently these requests have been halted.

PHOTOS



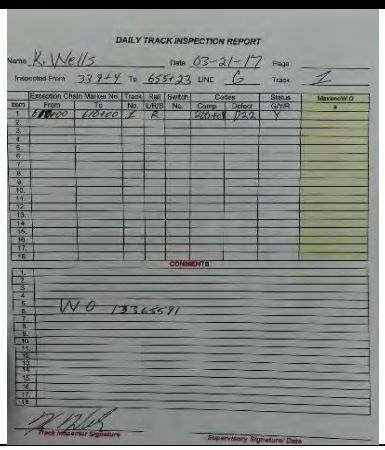
Washington Metropolitan Area Transit Authority
Maintenance and Material Management System
TRST Track Walker Report - 03/21/2017

Total WO : 0 Line: G Track: 1 Start Marker: 0339+41 End Marker: 0655+23 Priority: ALL
Defect Code: ALL Component Codes: ALL Office: ALL Components: ALL

Inspection Completed per WMATA 1000 Standards? Yes No If No Why? Do to a speed restriction at 610+00 tk G2. Personal completed a tool box safety meeting. Inspection from Largo 623+60 to 610+00 tk 2. G2 610+00 Richman acher bolts not holding 120" WO 13365591

Track Walker: Kenneth Wells Date: 03/21/17
Flag Person: Keith Wiseman Date: 3/21/17
Track Inspection Supervisor: Date:

Manual TRST Track Walker Report



DAILY TRACK INSPECTION REPORT

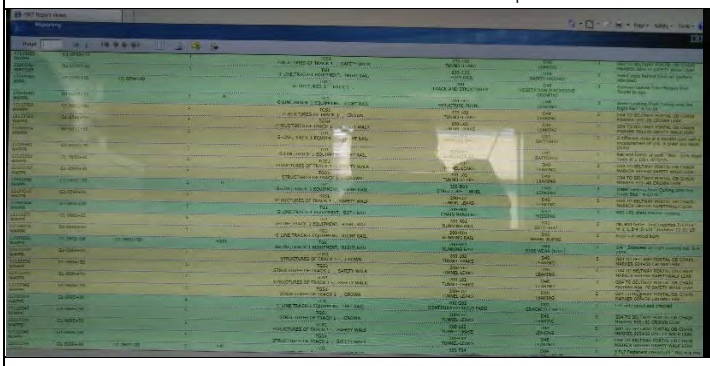
Name: K. Wells Date: 03-21-17 Page
Inspected From 339+41 To 655+23 LINE G Track 1

Item	Exception Chain Marker No. From	To	Track No.	Rail L/R/S	Switch No.	Codes Comp.	Defect	Status O/Y/R	Maximo O #
1	610+00	610+00	1	R		220-03	D22	Y	

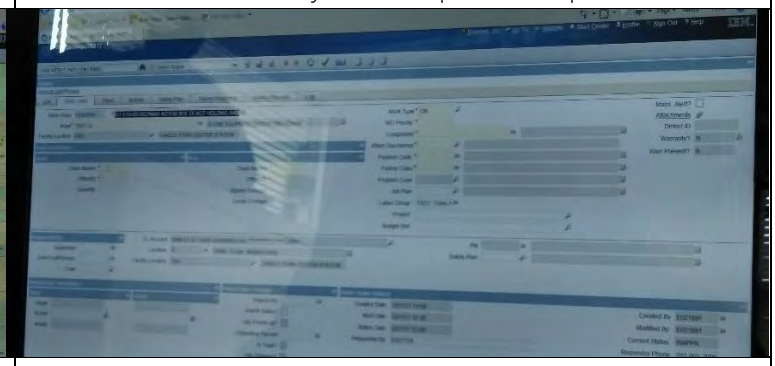
COMMENTS
WO 13365591

Track Inspector Signature Supervisory Signature/ Date

Manual Daily Track Inspection Report



Searching for duplicate defects

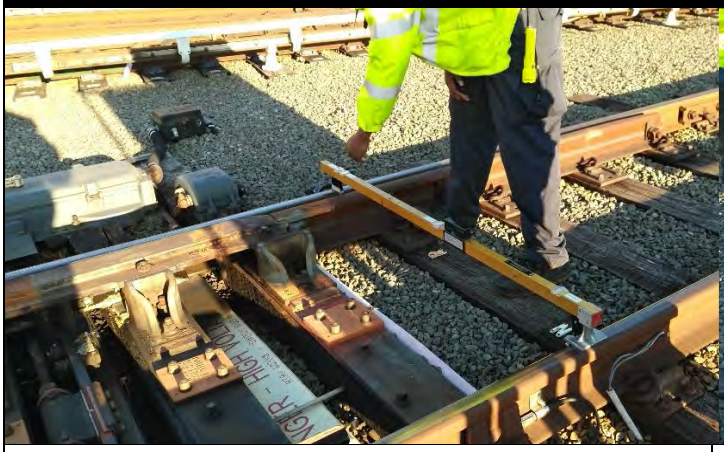


MAXIMO Track Inspector Defect Interface

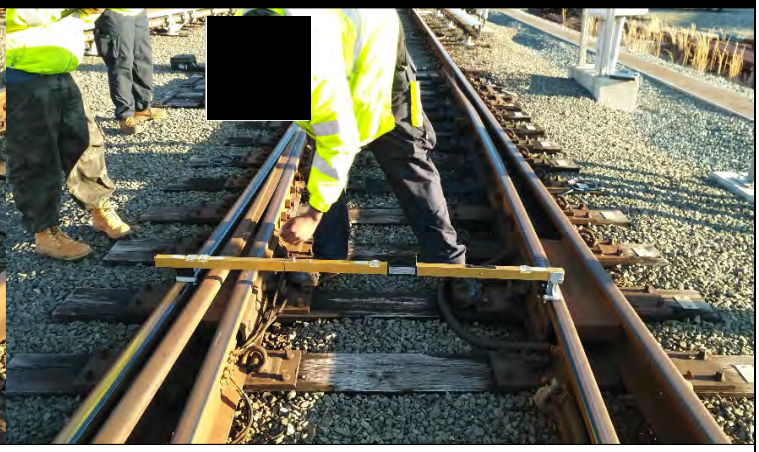
Summary	
Date	**Background**
March 22nd 2017	QICO accompanied three (3) track inspection on the yard switch inspection walk, two (2) Class AA walkers, one acting as the RWIC, the other recording the inspection notes, and a Class B inspector performing the inspection. The switches inspected were 165 and 167 in New Carrollton Yard.

KEY OBSERVATIONS		
Item Number		**Observation**
6		Switch 165 Inspection
	a	The walk began at switch 165. The RWIC called the yard operator and received permission enter the ROW.
	b	The inspector used a track gauge to check gauge, cant, and flange-way at the points, the toe of the frog, the point of the frog, and the heel of the frog, on both the straight and switch side of the turnout.
	c	The other inspector recorded the information and did a brief visual inspection of the switch before moving on to the other switch being inspected.

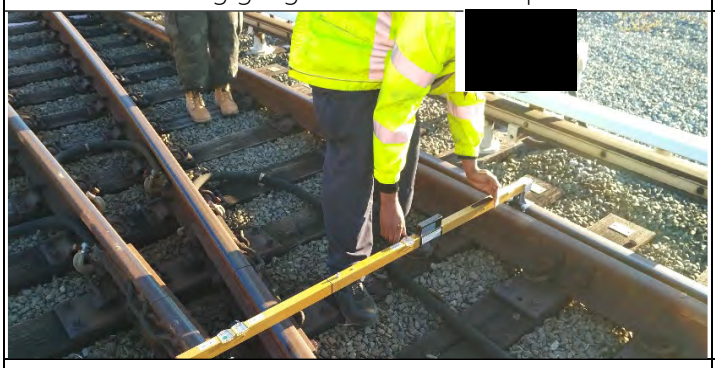
PHOTOS



Checking gauge and cant before points



Checking gauge and cant at heel of points



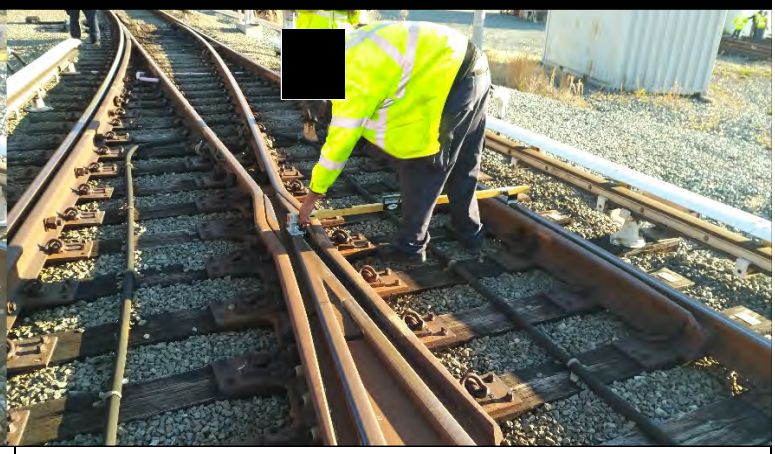
Checking flangeway gap

Monthly Switch Inspection Report

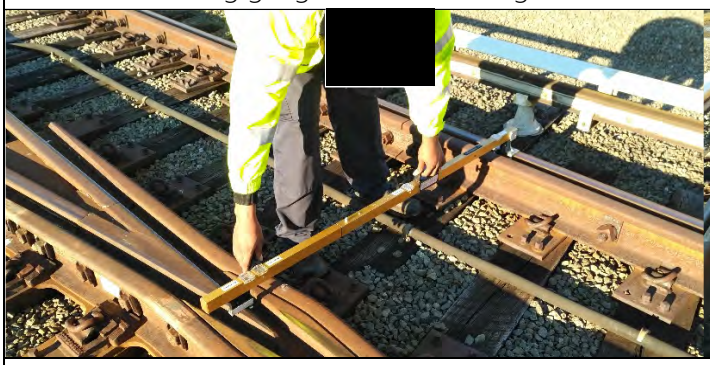
KEY OBSERVATIONS		
Item Number		Observation
7		Switch 167 Inspection
	a	After complete the inspection of switch 165 the inspectors moved to the neighboring track to inspect switch 167. The RWIC called the yard operator to inform the inspection was changing tracks and received permission.
	b	The inspector used a track gauge to check gauge, cant, and flange-way at the points, the toe of the frog, the point of the frog, and the heel of the frog, on both the straight and switch side of the turnout.
	c	The other inspector recorded the information and did a brief visual inspection of the switch before completing the walk.

PHOTOS

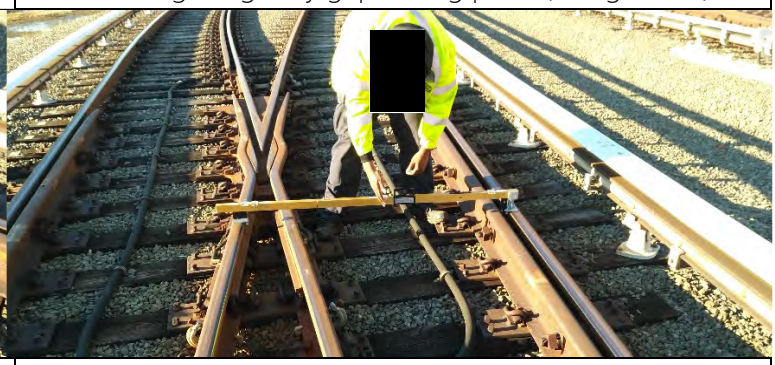
Checking gauge and cant at frog heel



Checking flangeway gap at frog point (Straight side)



Checking flangeway gap at frog point (Diverging side)



Checking gauge and cant at frog toe

Summary	
Date	Background
March 22nd 2017	QICO accompanied a Class AA Track Inspector on the D Line from Deanwood to New Carrollton on Track 2. The Inspector was met by an inspector from another yard who would perform as the RWIC.

KEY OBSERVATIONS		
Item Number		Observation
8		Platform Inspection
	a	The walk began at Deanwood, however the Track 2 inspection does not include the track through the platform.
	b	To compare practice QICO discussed track inspection through the platform areas with the inspector while waiting for track access. He agreed with the previous day's inspector that foul time must be called in order to inspect the platform track because there is no area to clear to for safety and so normally conducts inspections from the raised platform.
	c	This raises the same issues as discussed above. It is difficult to see the field side of the far rail and its fasteners and so should not be the normal method of track inspection through platforms.

PHOTOS	
No Inspection Performed	

KEY OBSERVATIONS		
Item Number		Observation
9		Ballasted Track Inspection
	a	After receiving permission to enter the ROW the inspection proceeded on Track to towards New Carrollton.
	b	The inspector explained that the track has undergone a number of tie renewal efforts and the remaining ties have already been placed in MAXIMO and are slated for replacement so unless a defect looked new he did not need to note the defects. He did however continually check that there were not multiple ties in a row that would create a safety concern.
	c	Similar to the tie the fasteners were to be replaced when the ties were being replaced so as long as there were not defects that would create a safety concern they were not noted.
	d	The inspector communicated that multiple fastener and tie defects in close proximity to each other are recorded together as one defect in Maximo. For example, three tie are defective from Station XXX+XX to Station XXX+XX, rather than each tie being an individual defect. The length is limited to about 100 feet, and then a new defect must be created.
	e	The inspector noted numerous third rail covers broken or missing along the walk.
		There was defective EGR and spots of pumping which were not noted because there was no change from previous inspections.

PHOTOS

Missing 3rd rail cover

Defective tie

Defective Emergency Guard Rail (EGR)

Area of track pumping

KEY OBSERVATIONS		
Item Number		Observation
10		Aerial Direct Fixation Track Inspection
	a	Upon reaching the aerial structure at Cheverly, the inspection noticed numerous grout pad and fastener defects. Upon further investigation, a Black condition was discovered.
	b	The defect consisted of six (6) grout pad and seven (7) fastener defects in a row on the right rail. The inspector checked the pocket manual which confirmed this condition qualifies as a Black condition.
	c	The inspector notified the RWIC who radioed control that an out-of-service order needed to be put into effect. The inspector gave the chaining of the defect and 600 ft before and after the defect to the RWIC and the track was removed from service.
	d	The inspector then call his supervisor to notify him of the condition.
	e	The inspector called MOC and notified them of the defect and a maintenance crew was dispatched to the defect location.
	f	One final train was permitted through the area as restricted speed, and then the inspection team headed to the next platform (Cheverly) to meet the maintenance crew.
	g	During the walk to the platform the track inspection was continued. A number of other grout pads were in poor condition as well as there were missing/broken third rail covers. But no more Red or Black conditions were noted.
	h	Also noted on the walk was an area of reconstructed grout pads on the left rail. The reconstruction was done is such a way the new grout pads and plates were offset from the grout pads and plated of the right rail, in some cases by a full grout pad width. This is a defect in rail construction that does not appear in the WMATA 1000 but does appear in Section 05653 Direct Fixation Track Construction specification. Section 3.01.A states *"Direct fixation rail fasteners shall be installed in pairs, opposite each other within a tolerance of one inch, at right angles to the centerline of track, one fastener under each running rail."* This should be noted as a defect but since it does not appear in the WMATA 1000 it was not.
	i	Given the grout pads could not be immediately replaced the maintenance supervisor determined that installing a gauge rod would be sufficient to allow service to be restored and the grout pads would be repaired that night.
	j	In order to install the gauge rod the emergency guard rail (EGR) had to be torch cut.
	k	The EGR was insufficiently bolted in a number of areas, and the inspector stated it was already recorded in MAXIMO.
	l	After corrective action was completed the Track Inspector informed QICO that the maintenance manager instructed him to not continue his inspection that day, the time was a little after 1:00 pm.

PHOTOS

Deteriorated grout pads

Old deteriorated grout pads and defective EGR

Defective grout pad and fastener

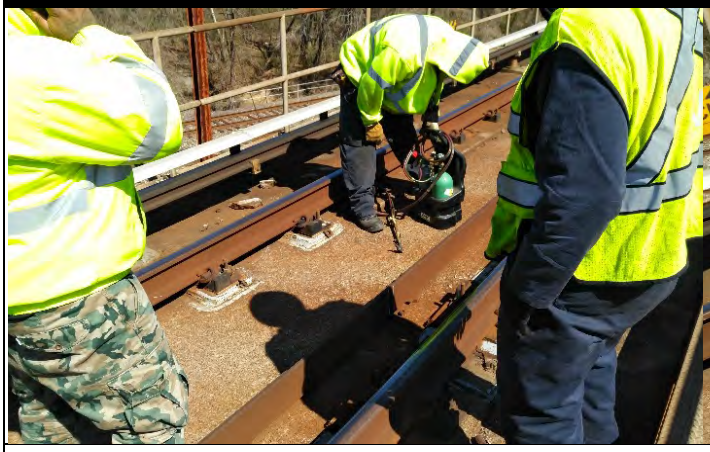
Defective grout pad and fastener

Multiple defective pads and fasteners (BLACK Defect)

Area with offset fasteners

KEY OBSERVATIONS		
Item Number		Observation
11		End of Inspection
	a	After corrective action was completed the Track Inspector informed QICO that the maintenance manager instructed him to not continue his inspection that day, the time was a little after 1:00 pm.
	b	Operations had resumed following the installation of the gauge rod, the maintenance manager had assumed responsibility for the track condition and felt it was safe to resume operation.
	c	The inspection team then boarded a train and returned to New Carrollton Yard.

PHOTOS



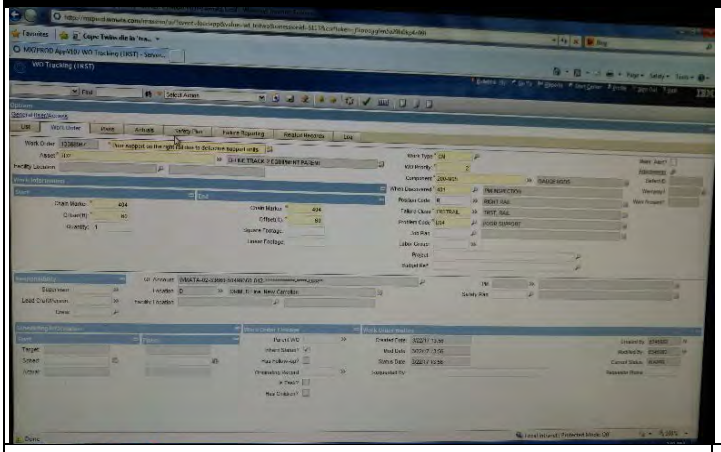
Maintenance Preparing Torch

Maintenance Installing Gauge Rod

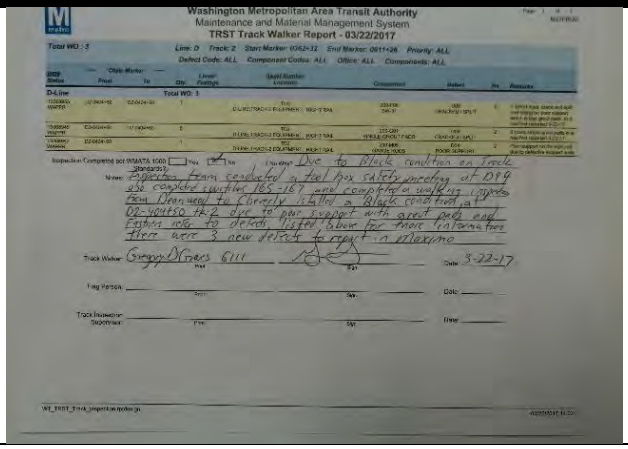
Completed Gauge Rod Installation

KEY OBSERVATIONS		
Item Number		Observation
12		MAXIMO
	a	After returning to the yard the inspector began to fill out the daily inspection report. QICO again observed that this done both manually and in MAXIMO. Upon inquiring the inspector confirmed both are required.
	b	After completing the manual inspection report, the inspector began entering data into MAXIMO, he confirmed to QICO that inspectors use to take a printout of the database with them so could note updated to defects while in the field but they are no longer allowed to bring it with so must reconcile defects once back at the office.
	c	In order to input the speed restriction defects into MAXIMO the inspector had to create multiple defect entries because the speed restriction was caused by a combination of grout pads and defective fasteners and multiple defects cannot be put into the same MAXIMO work order.

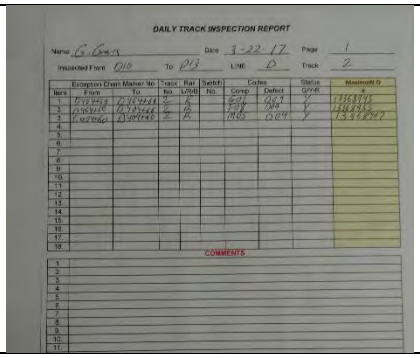
PHOTOS



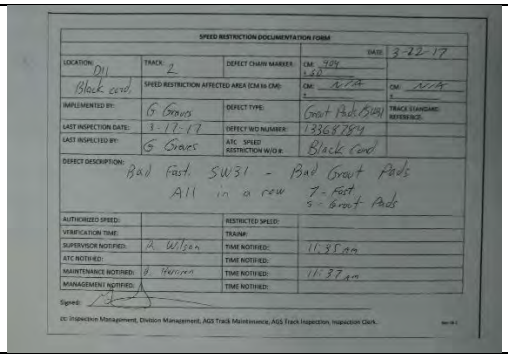
MAXIMO track defect creation



Manual TRST Track Walker Report



Manual Daily Track Inspection Report



Speed Restriction Documentation Form

Summary	
Date	Background
March 22nd & 23rd, 2017	The following are general observations QICO made during the two days of audit through discussion with the supervisor and inspectors as well as through field observations.

KEY OBSERVATIONS		
Item Number		Observation
13		Staffing
	a	Both days QICO audited the track inspectors substantial delays were experienced due to staffing issues.
	b	Both days suffered from having to wait for staff from other yards to supplement the New Carrollton workforce, and availability of these support personnel is unknown until the morning begins.
	c	Also, there are personnel issues and conflicts which provided for even greater delay the first day.
	d	QICO arrived at the yard at 7:30 am at the request of the inspection supervisor yet staff left the yard to reach their inspection areas around 9:30am the first day. The second day the yard switch inspection were performed shortly after the 8:00 am safety briefing then the group returned to the office and waited until support staff arrived so they could divide into their inspection areas.
	e	Both days a Safety briefing was held in the office by the inspection supervisor, and then another safety briefing was conducted by the RWIC on-site.
	f	QICO discussed staff seniority/rotations with the inspection supervisor to better understand the process and several issues were discovered. Based upon the discussion, staff rotate between yard assignments once a year. As seniority grows there becomes a stagnation issue, as staff with seniority choose the same yard every year. This reduces the amount of "new eyes" in the yard, which can lead to complacency in inspection. Rotation of walking assignments within the yard also are based on seniority. This leads to a similar issue of those with seniority choosing the same track walk at every rotation. Overall this can lead to tracks being seen be the same inspectors for many years and only getting reviewed by others when the normal inspector goes on vacation or takes sick leave. There is a habit to think that one knows the track and where all the problems are, which can lead to overlooking new issues until they become significant.
14		ROW access
	a	Both days QICO audited the track inspectors, substantial delays were experienced due to the control center not clearing the inspectors to access the ROW.
	b	On day one the inspectors arrived at the site (Largo) by 10:00 am and were not allow on the track until ROUND 11:30am. According to the inspector this is common place. After speaking with the supervisor the next day he stated that if OPS is called in advance of advance of arriving the inspectors will be called on much closer to 10:00 am.
	c	The second day the inspectors arrived on site before 10:00 am (Deanwood) and were not allowed on the track until around 10:45 am. This was due to the clear of a previous emergency near the area.

Summary	
Date	**Background**
March 22nd & 23rd, 2017	The following are recommendations from QICO based on the two-day audit of the walking track inspections observations mentioned above.

KEY OBSERVATIONS		
Item Number		**Observation**
1		Platform Inspection
	a	Changes should be made to allow under platform clearing or calling for foul time should occur on a regular basis to ensure the track through the platform inspection completely at appropriate intervals.
2		Interlocking/Switch Inspection
	a	Detailed procedures should be created to ensure interlockings are given complete inspections at the appropriate interval.
	b	Control should not put pressure on track inspectors to rush through inspections.
3		Direct Fixation Track Inspection
	a	Grout pad/Fasteners not being placed in accordance with the Section 05653 Direct Fixation Track Construction specification. Section 3.01.A which states *"Direct fixation rail fasteners shall be installed in pairs, opposite each other within a tolerance of one inch, at right angles to the centerline of track, one fastener under each running rail."* should be added to the WMATA 1000 and defect ratings should be produced so when track is constructed improperly it can be termed defective and a speed restriction put in place.
	b	Establishing more detailed procedure so that inspectors can better prepare maintenance crews about defects they are coming to repair will help speed up the repair process.
	c	Allowing inspectors to properly describe the defect and location to MOC and then continue their inspection would greatly reduce the number of incomplete track inspections. In the two (2) days QICO audited track inspection, neither mainline walk was completed. A method
	d	Defining in greater detail the appropriate procedure for who request maintenance to come to the site so inspector the is not delayed waiting for maintenance, who has never been notified of the issue will reduce delays in returning track to service.
	e	Anchor bolts should conform to construction specs. Currently the anchor bolts on the direct fixation track at Largo are of insufficient length. The bolt currently installed are of a length that only permits around 0.25 in of tread to be in the insert. The Current specs are for a minimum of 1 in of the anchor bolt be threaded into the concrete insert.
	f	Maintenance should be trained on construction specifications so when they come to a problem they have greater knowledge to draw a solution from. To explain to QICO that longer bolts are not available and so the problem is repaired incorrectly, when the current engineering drawing specify a longer bolt is a waste of time and resources.

	g	Specifications should include how to proper clean inserts and core holes. In past inspection QICO has witnessed improper preparation of core holes before threaded rods are epoxied into the holes, and again the ability to properly torque anchor bolts into a hole packed with dirt and grime is not possible.
	h	Proper training should be provided to crews so that proper construction and maintenance is performed. The specification to torque anchors to a certain value requires the use of a torque wrench.
	i	Also, the fact that bolts are falling out of inserts shows that a regular maintenance procedure is not in place. The maintenance manager recommends an anchor torqueing routine of one every 3 months or so. The manufacturer recommends re-torqueing anchors after 1 month of new installation as new steel relaxes after installed.
	j	Update the WMATA 2000 to more clearly define who is to add the 600 ft before and after the defect for speed restrictions to ensure the an extra 1200 ft is not being added to restriction. From the audit the track inspector are adding the distance and providing that to the control center. The WMATA 2000 Section 30.4.4 state "The MOC is responsible for determining the contiguous blocks and the specific speed restriction to be applied that will ensure that the approaching trains enter and leave the requested restriction area (600 feet before to 600 feet after work zone) … this lends to the MOC adding the extra 1200 feet not the inspector.
	k	Repair of torch cut EGR should be added to procedures to it is repaired after being temporarily being modified to fix another track issue.
4		End of Inspection
	a	Maintenance supervisors should not interfere with track walking completion, there was almost another hour in which inspection could have been performed, this wastes resources and makes it more difficult for the inspection supervisor to meet Track Inspections obligations.
5		MAXIMO
	a	Requiring both a hand-written report and a MAXIMO entry seems like an inefficient use of time and resources. Consider using electronic means only to record the inspection.
	b	Manually reviewing MAXIMO after the inspection to sync the defects is slow and tedious and can lead to duplicated defects. Allowing the use of the MAXIMO database in the field would help eliminate the time required to sync up the field notes with MAXIMO after the inspection. If this is a concern given experience, consider implementing a rotation of staff to ensure fresh eyes are physically reviewing the track on a regular basis to minimize the issues with having the database in the field.
	c	A good portion of the time inputting the inspection information into MAXIMO was due to the inspector not being familiar enough with the software to be efficient. Having a trainer MAXIMO user review inspector's efforts on a periodic basis and make recommendations for additional training would help reduce these inefficiencies and improve overall quality and productivity.

	d	The process of removing defects from MAXIMO after they have been repaired requires MOC to remove them, inspectors do not have the authority to remove them. This is a problem is the repair work order is not produced from the inspectors MAXIMO entry, in the case of a speed restriction for example, MOC created an order from the in-the-field call. Upon returning to the office the repair was completed and the order closed, this prevented the inspector from being able to attach the previous defects to the order, leaving them "orphaned". Inspectors should have the ability to update, including removing defects, this would keep MAXIMO cleaner and reduce the time needed to maintain the database.
	e	The requirement to input multiple defect separately when in the same area has been identified as an issue. The problem noted is the speed restriction was caused by different defects, none on their own a BLACK condition, that together created a BLACK condition. Having them all independent does not allow for properly describing the interaction of the defects. Even with a parent relationship. For example, the BLACK condition noted during this audit resulted from a mix of bad grout pads and bad fasteners. This combination of defects was temporarily address by maintenance through the installation of a gauge rod. A gauge rod is a YELLOW defect. This YELLOW defect was sufficient to lift the speed restriction, however it in no way addressed the two RED defects, which together created the BLACK condition. However, in MAXIMO these defects had to be listed as yellow because there was no longer a speed restriction present, this situation is not representative of the actual track condition because each defect is separate. Since they are listed as YELLOW it is possible the problem could go unattended for an extended period, which could lead to an even greater safety issue. However, if there was a more connected way in MAXIMO to address this speed restriction it would provide for better tracking of the defects which caused the restriction and the associated corrective actions taken to repair them.

Summary	
Date	Background
March 22nd & 23rd, 2017	The following are recommendations from QICO based on discussion with the supervisor and inspectors as well as through field observations during the two days of audit.

KEY OBSERVATIONS		
Item Number		Observation
6		Staffing
	a	Having insufficient personnel is a known issue. There are a number of ways to address this problem and minimize delays. One way is to of course hire more staff but another consideration would to use technology to allow for greater utilization of the personnel on hand. Several the above recommendations would help the inspectors cover greater lengths of track in the given amount of time. Other option would be to implement the TGV on a more primary inspection role and have the track inspectors focus on confirmation of defects and inspection of areas the TGV is not well suited.
	b	Delays caused by needed to wait for staff from other yards could be mitigated through better scheduling and communication. It can be very difficult to shift staff at the last minute, but there does not appear to be any reason the borrowing of staff cannot be confirmed before the day of the inspections.
	c	It can be difficult to prepare for every issue staff may bring, however, providing more management training to supervisors to handle these situations could greatly reduce the delays and stress they cause. The main issue the first day of the audit was caused by an inspector who had been out sick and needed to be cleared by medical before returning to duty, there were issues with this over the weekend that were not resolved, it was unclear if Metro medical was open on the weekend to clear the staff, paperwork was not properly filled out, paperwork was misplaced and time was spent looking for it, it was a combination of both the supervisor and the inspector, but the supervisor should have been better equipped to address the situation.
	d	Safety is a top priority; however, this appears to be a waste of time since the safety briefing does not address any track related safety issues. Consider either enhancing the office safety briefing to have a more meaningful safety impact on the day's efforts or eliminating it and providing only the on-site safety briefing conducted by the RWIC.
	e	Consider revising the rotation selection by seniority system. It is important to know that someone else will be inspecting the track after you. IT leads to more care being taken to identify new or changed issues. Both days QICO audited track speed restrictions were put in place, one of those was due to a black condition in concrete pads, which means it was unlikely to have occurred since the track was inspected the previous week. This highlights the point of having "new eyes" inspected the track. The same can be said for rotation in the yard. The junior inspectors are usually left with

		the less desirable (longer in this case) inspections. Which means that the senior inspectors are not inspecting a large portion of the inspection area because they always choose the same walk.
7		ROW access
	a	Consider providing training to inspectors and supervisors to ensure all personnel know the proper procedure for accessing the track. If delays can be reduced just by calling ahead, that should be standard operating procedure implemented by all inspectors.
	b	It also be necessary to put limits on the delay operations can put on track inspectors. There is a limited window in which mainline inspection can occur, if it is regularly being reduced due to track access the system will continue to have safety issues. Consider setting a limit, for example 15 minutes, meaning operations has 15 minutes to make a window for inspectors to access the track, this provides time for the a few trains to clear the area an gives some flexibility to operations while not delaying the inspectors to the point that they cannot complete the daily inspection.

PREPARED BY:	QICO OFFICER	

APPROVED BY:	QICO MANAGER	

8.10APPENDIX E: APPLICATION OF REGULATORY CAPS

Measure	Finding	QICO Review:
Regulatory Findings - NTSB	NTSB R-8-004-A: *Promptly implement appropriate technology that will automatically alert wayside workers of approaching trains and will automatically alert train operators when approaching areas with workers on or near the tracks.* Status as of 3/31/2017: Open	- After participating in daily track walking inspections, QICO believes that the technology as described in the November 16, 2017 WMATA Board Meeting does not apply to the nature of the work for walking track inspectors. It requires a detector unit to be affixed to a rail nearby a workzone; since walking track inspectors do not set up a workzone, the technology cannot be used as described: *The Authority is moving forward with a pilot program of a two piece warning device for right-of-way areas with limited visibility. The detector unit is affixed to the web of the rail, and when triggered by either a passing train or flagman/watch out, it will alert all those wearing the personal armband warning devices via an audible and visual alarm to clear the track. Phase 2 of the pilot will include carborne equipment that will alert the train operator of the presence of workers on the right of way.*
Regulatory Findings - TOC	TOC-SRT-15-002-A: *WMATA must revise track inspection procedures, documentation, and reporting processes to ensure that leak measuring and monitoring is a routine aspect of inspections in tunnels.* Status as of 3/31/2017: Under Review FTA Safety Directive 16-4 T-9: *WMATA must ensure that track inspectors and maintenance address drainage defects.*	- The upcoming revision for the WMATA TRST-1000 Field Inspection Manual includes tunnel leaks as part of a walking track inspection checklist, with associated Maximo Component and Defect Codes. In addition, Optram has a "water leak" preference file to view water-based defects noted by walking track inspections throughout the system.
Regulatory Findings - FTA	CAP FTA-Rail-2-16-B: *WMATA must evaluate whether re-organization or consolidation of training functions would improve the agency's ability to manage, schedule, budget for, develop, oversee and assess training and ensure that training material remains up-to- date.* Progress Status as of 3/31/2017: Closed	- QICO noted Technical Skills Maintenance Training Instructors (under Operations Management Services OPMS) attending the new track walking class at Carmen Turner Facility. - The challenge is to ensure that these future in-house instructors have a similar level of capability as the current consultant instructing the class. This is something which QICO intends to investigate when classroom instruction is handed over to OPMS:Technical Skills Maintenance Training in the future. (See What Worked Well: track walking class)

8.10APPENDIX E: APPLICATION OF REGULATORY CAPS

Measure	Finding	QICO Review:
Regulatory Findings - FTA	FTA-Rail-4-27-A: *For all major departments with inspection and maintenance responsibilities for critical infrastructure, WMATA must establish and/or update a preventive maintenance and inspection testing quality audit process to ensure compliance with established maintenance and testing practices, and to monitor missed or incomplete preventive maintenance activities and/or inspections.* Progress Status as of 3/31/2017: Open	- This review is one of many maintenance and inspection internal reviews that will be conducted by QICO as part of an annual system-wide review. The track inspection review encompassed a systematic review of documentation, inspection practices as described in interviews with key personnel, and shadowing field inspections. QICO will follow up on these reviews with individual assessments to ensure that maintenance and inspection practices are in compliance and to instil within the Authority a culture of continual improvement.
	CAP FTA-Rail-4-28-A: *WMATA must review the workload and inspection territory assigned to track inspectors, and leverage non-track inspectors to perform watchman duties.* Progress Status as of 3/31/2017: Open	- WMATA walking track inspections have not systematically moved to three-person track teams for track inspections. Note that Operations have instituted other safety protections recently (e.g. 10-mph speed around all roadway employees). Track Inspections should explore defining high risk areas that require an additional escort as a start towards fulfilling this goal.
	FTA-Rail-7-40-A: *WMATA must develop a training strategy for improving the capabilities of employees to enter, analyze and assess information into the agency's Maintenance Management Information System.* Progress Status as of 3/31/2017: Open	- It was observed through the two days of field inspection shadowing that less-experienced track walkers (e.g. C and D) had difficulties entering their defect information into Maximo. The new track walking inspection course does not include Maximo training as part of its syllabus, though the Authority offers separate classes on Maximo. (See QICO-TIP-17-06)
	Safety Directive No. 16-4 T-1: *WMATA must develop additional track inspection training and certification requirements, and expand mentoring.* Progress Status as of 3/31/2017: Open	- As noted above, WMATA is currently retraining all track inspectors to increase proficiency in special trackwork inspections. QICO is committed to performing spot checks on mainline special trackwork inspections to ensure switch inspection and documentation is in compliance with governing documentation.
	Safety Directive No. 16-4 T-2: *WMATA must establish a new track inspection plan that expands time available for track inspection through additional inspection shifts (i.e., evening and nighttime) and more frequent inspections of priority locations.* Progress Status as of 3/31/2017: Open	- Additional inspections are being conducted on evening shifts (1600-2200) for areas of track low headways (core silver/blue/orange) and safety-sensitive areas (Track E2 in the vicinity of Greenbelt). (See What Worked Well: additional protections)

8.10APPENDIX E: APPLICATION OF REGULATORY CAPS

Measure	Finding	QICO Review:
Regulatory Findings – FTA	FTA Safety Directive 16-4 T-3: *WMATA must commit adequate resources and technically qualified personnel to the inspection of special trackwork and the completion of required corrective maintenance.* Progress Status as of 3/31/2017: Open	- As noted above, WMATA is currently retraining all track inspectors to increase proficiency in special trackwork inspections. QICO is committed to performing spot checks on mainline special trackwork inspections to ensure switch inspection and documentation is in compliance with governing documentation. - (QICO-TIP-17-02)
	FTA Safety Directive 16-4 T-4: *WMATA must expand the use of the TGV in its track inspection program, and ensure the training and certification of the TGV crew.* Progress Status as of 3/31/2017: Open	- As noted above, the TGV has been performing inspections at the required frequency and has a plan to augment staff and adequately cross-train all staff in UT, TGMS, and vehicle operation. QICO emphasizes the larger problem of systematically analysing the data that is uploaded from the TGV and other third party inspections (QICO-TIP-17-12). Another issue is decreasing the time it takes to validate data (QICO-TIP-17-14).
	FTA Safety Directive 16-4 T-5: *WMATA must revise the TRST 1000 manual, or establish a separate track inspection manual, focused on inspection safety limits.* Progress Status as of 3/31/2017: Open	- The upcoming revision of the TRST-1000 manual is in its final stages of development and approval. It is currently organized into two documents: a field inspection manual and an office manual.
	FTA Safety Directive 16-4 T-6: *WMATA must establish a clear process for imposing and removing speed restrictions.* Progress Status as of 3/31/2017: Open	- Instructions for implementing and removing speed restrictions are set forth within the WMATA TRST-2000 "Track and Structures Maintenance Control Policy," and Roadway Worker Protection (RWP) SOP #30. QICO noted an issues with speed restriction communication in (QICO-TIP-17-01) and (QICO-TIP-17-15)
	FTA Safety Directive 16-4 T-7: *WMATA must develop a formal procedure and protocol to ensure the maintenance managers and track inspectors share information and jointly establish maintenance priorities.* Progress Status as of 3/31/2017: Open	- Walking track inspection area supervisors produce a list of "Top Inspection Concerns" for a monthly meeting between track inspection and track maintenance for each area (New Carrollton, Branch Avenue, Shady Grove, Dulles and Alexandria). TGV identified wide-gauge defects are also shared with maintenance personnel for inclusion into track maintenance planning.
	FTA Safety Directive 16-4 T-8: *WMATA must provide additional training and resources to maintenance managers related to the use of inspection information to establish maintenance priorities.* Progress Status as of 3/31/2017: Open	- Additionally, Track Engineering (part of Maintenance-of-Way Engineering MOWE) should provide a system-wide engineering analysis of the various sources of inspection data. Other areas for improvement exist with increased utilization of Optram. (See QICO-TIP-17-12) (QICO-TIP-17-07)

8.10APPENDIX E: APPLICATION OF REGULATORY CAPS

Measure	Finding	QICO Review:
Regulatory Findings – FTA	FTA Safety Directive 16-4 T-10: *WMATA must provide additional supervisory staff or contractors to oversee track inspection and track maintenance activities and ensure conformance with WMATA track safety standards.* Progress Status as of 3/31/2017: Under-Review	- WMATA walking track inspections have not systematically moved to three-person track teams for track inspections. As noted above, with a staff augmentation through the use of contractors, the walking track inspection force (46) is adequate to inspect 234 miles of track twice weekly, while keeping the average walk to around five miles of track per day. (See What Worked Well: Additional Protections)
	FTA Safety Directive 16-4 T-11: *WMATA must develop a special inspection and repair plan to address inappropriate stud bolt installation and missing fasteners, and ensure track maintainers and contractors are trained in stud bolt installation and rail clip installation, and that work is adequately overseen.* Progress Status as of 3/31/2017: Under-Review	- During QICO's field inspection shadowing of daily track walking inspections, a configuration control issue was discovered for areas of track utilizing anchor bolt inserts for the fastening system; anchor bolts were noted as pulling out of the inserts leading to loss of proper rail restraint. QICO discovered that the anchor bolts used were too short for the anchor bolt insert, which was not in compliance with the standard drawings used for the fastening system arrangement. QICO is in the process of following up with Track Engineering (MOWE) on the issue and conducting an independent engineering analysis on fastening system requirements. (Attachment H: QICO Field Inspection Visits)

9 REFERENCE DOCUMENTS

9.1 REFERENCE 1: JOB DESCRIPTIONS

0859h

Code No. 5475 (D)
Code No. 5474 (C)
Code No. 5473 (B)
Code No. 5472 (A)
Code No. 5471 (AA)

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

JOB DESCRIPTION

POSITION: Track Walker

DATE: 6-10-92

DEPT/OFFICE: RAIL/PLNT

REPORTS TO: Assigned Supervisor

APPROVALS:
RAIL [redacted]
PERS [redacted]
LABR [redacted] 9/11/92

POSITION SUMMARY:

This is skilled technical track inspection work. An employee in this job is responsible for inspecting track and track related components, performing minor repair and maintenance work, skilled and unskilled labor tasks, calibration and use of track gauges, levels and other measuring devices. The work requires an understanding of maintenance procedures and practices, maintenance theory, the materials, parts, tools, test equipment and operating systems associated with WMATA track and track components.

Track Walker (D)

Employees are assigned track inspection and minor maintenance and repair work in subways, on aerials and on ballasted track sections. Employees are expected to gain familiarity with WMATA operating practices and safety rules. All important aspects of the work are subject to detailed and specific procedures which the employee follows closely. Employees receive instruction and close supervision on new assignments, while regular assignments are performed independently. Work is normally reviewed and verified upon completion. Employee is supervised by assigned Line Quality Manager.

Track Walker (C)

Employees are assigned track inspection and minor maintenance and repair work in subways, on aerials and on ballasted track sections. Employees are expected to handle all normal aspects of the job, applying all standard approaches, methods, procedures, tools and equipment to varying situations, referring only unusual or non-standard matters to a supervisor. Employees make most work decisions independently based on WMATA operating practices and safety rules but refer technical policy or procedural questions to a supervisor for a decision. Work is reviewed periodically to check progress and conformance to established policies and requirements by assigned Line Quality Manager.

Track Walker (B)

Employees are assigned track inspection and minor maintenance and repair work in subways, on aerials and on ballasted track sections. Employees are expected to handle all normal aspects of the job, applying all standard approaches, methods, procedures, tools and equipment to varying situations,

referring only unusual or non-standard matters to a supervisor. Employees make most work decisions independently based on WMATA operating practices and safety rules but refer technical policy or procedural questions to a supervisor for a decision. Work is reviewed periodically to check progress and conformance to established policies and requirements by assigned Line Quality Manager.

Track Walker (A)

Employees are assigned track inspection and minor maintenance and repair work in subways, on aerials and on ballasted track sections. Employees are expected to handle all normal aspects of the job, applying all standard approaches, methods, procedures, tools and equipment to varying situations, referring only unusual or non-standard matters to a supervisor. Employees make most work decisions independently based on WMATA operating practices and safety rules but refer technical policy or procedural questions to a supervisor for a decision. Work is reviewed periodically to check progress and conformance to established policies and requirements by assigned Line Quality Manager.

Track Walker (AA)

Employees are assigned track inspection and minor maintenance and repair work in subways, on aerials and on ballasted track sections. Existing rules, regulations and procedures govern the work but employees use considerable judgement in interpreting and applying them to unusual or non-standard situations. Employees frequently develop and refine their own work routines and are expected to carry assignments through completion independently. Work is reviewed in general terms through spot checks and occasional checking of results by assigned by Line Quality Manager.

EXAMPLES OF DUTIES (ALL LEVELS):

Performs flagging, cleaning, lubrication, inspections, required adjustments, testing, troubleshooting and minor repairs and scheduled maintenance on assigned track section in accordance with WMATA track standards, layout, diagrams, schematics, operation manuals and manufacturer's maintenance instructions.

Performs scheduled and unscheduled inspections, troubleshoots and tests track and track components using precision measuring equipment such as track levels, track gauges and other related measuring devices.

Attends on-the-job and formal training classes; assists individuals in higher classifications in their assignments or provides job specific training to lower classifications.

Responds to and provides assistance in snow emergencies and emergencies which require inspection of or repair to track involved in incidents, accidents or derailments.

Performs all tasks and assignments within the established safety practices and maintenance guidelines under varying weather conditions.

May operate Authority vehicles between work locations.

Work variable shifts, days and hours as required and as provided for under existing Union contract.

Performs all other related duties as required.

KNOWLEDGE SKILLS AND ABILITIES (ALL LEVELS):

Knowledge of and demonstrated ability to perform all duties at current and next level.

Knowledge of assigned TRST section's functions, procedures and guidelines and the maintenance requirements of the Authority operation supported.

Knowledge of and demonstrated ability to identify and apply basic facts and principles of the Authority's operating, maintenance and safety rules, regulations and procedures.

Ability to communicate effectively orally and in writing.

Ability to accept supervision and complete duties and work assignments timely and accurately.

Ability to deal courteously and effectively with supervisors and coworkers.

Ability to perform laborer and track repairer duties effectively.

Track Walker (D)

Ability to identify facts and terms of track maintenance and inspection principles and theories and how they relate to a rapid transit system.

Ability to recognize engineering symbols, read and use drawings, schematics, and layout diagrams, operational manuals and manufacturer's maintenance instructions to inspect and repair track and related track components.

Ability to identify and correct routine track and track related deficiencies. Employee expected to perform simple parts of the procedure with assistance or demonstration from supervisor or positions in higher classifications.

Ability to select and use correct parts, tools and test equipment to determine scheduled and unscheduled inspection and maintenance required to maintain track and track related components.

Track Walker (C, B, A)

Ability to analyze facts and principles based on knowledge of track maintenance and inspection theories and draw conclusions in application to a rapid transit system.

Ability to identify and correct difficult track and track related deficiencies. Employee expected to perform all tasks independently with occasional spot checks of completed tasks. Employee demonstrates competency for speed and accuracy.

Ability to select and use correct parts, tools and test equipment; analyze readings and test results to determine scheduled and unscheduled inspection maintenance required to maintain track and track related components.

Ability to interpret schematic and layout diagrams, operational manuals, manufacturer's maintenance instructions and inspection manuals to inspect and diagnose track and track related deficiencies.

Track Walker (AA)

Ability to evaluate conditions, make independent decisions based on advanced knowledge of track maintenance and inspection theories and principles as the relate to a rapid transit system.

Ability to identify and correct complex track and track related deficiencies. Employee is expected to perform and complete tasks independently, quickly and accurately. Employee is proficient and able to explain or demonstrate proper procedures to subordinates. Ability to provide leadership to instruct and review work of lower level positions.

Ability to select and use correct parts, tools and test equipment; analyze, evaluate and interpret test results to determine scheduled and unscheduled inspection maintenance required to maintain track and track related components.

Ability to interpret schematic and layout diagrams, operational manuals, manufacturer's maintenance instructions and inspection manuals to inspect and diagnose track and track related deficiencies.

Maintain understanding of current trends, policies, technologies and techniques of the track inspection fields specifically relating to the section of TRST assigned.

May serve as Leadman.

QUALIFICATIONS AND EXPERIENCE:

Graduation from high school or possession of a high school equivalency certificate, and satisfactory completion of an acceptable training program in track inspection and maintenance or a related field is required.

Track Walker (D)

Considerable knowledge of and have performed satisfactorily the duties of a track walker or track repairer or related field for a period of not less than two (2) years.

Track Walker (C)

Considerable knowledge of and have performed satisfactorily the duties of a track walker or track repairer or related field for a period of not less than three (3) years.

Track Walker (B)

Considerable knowledge of and have performed satisfactorily the duties of a track walker or track repairer or related field for a period of not less than four (4) years.

Track Walker (A)

Considerable knowledge of and have performed satisfactorily the duties of a track walker or track repairer or related field for a period of not less than five (5) years.

Track Walker (AA)

Considerable knowledge of and have performed satisfactorily the duties of a track walker or track repairer or related field for a period of not less than six (6) years.

Or, an equivalent combination of education an experience.

LICENSE:

Possession of a valid District of Columbia, Maryland or Virginia motor vehicle operator's license issued from jurisdiction of residence. Safe driving record with no more than four (4) points accumulated over the past three (3) years.

MEDICAL GROUP:

Ability to complete satisfactorily the medical examination for this class.

Ability to perform strenuous physical tasks including frequent lifting of objects weighing up to 50 pounds and occasionally to 100 pounds.

Ability to distinguish basic colors for safety identification.

Must have maximum uncorrected vision of 20/60 in each eye and corrected vision in each eye of at least 20/30.

Local 689, ATU Represented
Maintenance and Construction District
In-class Progression Only

Grade
Grade
Grade
Grade
Grade

Refer to the current **Union Contract** for the current **Progression Rates** for these positions.

Pay
Pay
Pay
Pay
Pay

Code No.: 5485

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

POSITION DESCRIPTION
Track Walker Trainee
RAIL/TSSM

Date: 8-7-08

FLSA: NON-EXEMPT
ROLE: 2

REVIEWED:
RAIL: [redacted]
COBN: [redacted]
LABR: [redacted]

REPORTS TO: Assigned Maintenance Manager

SUMMARY:

This is a student level position leading to completion of the Track Walker Inspection Training Program (TWITP). Upon completion the trainee's will be placed in a Track Walker D position. Employee is responsible for satisfactory completion of all assigned formal training and on-the-job training (OJT). Employee is expected to complete the training in twenty-seven (27) weeks and pass the Track Walker certification exam. While on OJT, the employee works under the close supervision of the Maintenance Manager and under the guidance of "Mentor" supervisors in the respective divisions of TRST.

MAJOR DUTIES:

Employee is assigned to formal training classes related to flagging, cleaning, lubrication, inspection, required adjustments, testing, troubleshooting and minor repairs on track sections in accordance with WMATA track standards, layout, diagrams, schematics, operation manuals and manufacturer's maintenance instructions.

Works in conjunction with assigned "AA" Track Walkers to perform schedules and unscheduled inspections, troubleshooting and testing of track and track components. Uses precision measuring equipment such as track levels, track gauges and other related measuring devices.

Performs all tasks in conformance with safety and maintenance practices and procedures.

Completes written and electronic documentation and reports for the operation and maintenance of TRST.

During operational emergencies, employee responds to and provides assistance including but not limited to securing and safeguarding WMATA property.

Performs related duties as required.

The above duties and responsibilities are not intended to determine specific duties and responsibilities of any particular position. It is not intended to limit in any way the right of supervisors to assign, direct and control the work of employees under their supervision.

KNOWLEDGE, SKILLS AND ABILITIES:

Knowledge of and demonstrated ability to perform all fundamental and rudimentary track inspection duties.

Knowledge of and demonstrated ability to identify and apply basic facts and principles of the Authority's operating, maintenance and safety rules, regulations and procedures.

Ability to communicate effectively orally and in writing.

Ability to accept supervision and complete duties and work assignments timely and accurately.

Ability to work variable hours, locations and days.

Ability to deal courteously and effectively with others.

MINIMUM QUALIFICATIONS:

Graduation from high school or possession of a high school equivalency certificate.

Must pass written standardized tests for reading, mathematics and mechanical aptitude (Bennett type). Will be required to demonstrate proficiency in writing.

Must be willing to commit to and sign an agreement to remain in the Track Walker position for a period of two years upon completion of the program. The twenty-seven weeks in training will be credited towards the two year period.

LICENSE:

Possession of a valid motor vehicle operator's license issued from the jurisdiction of residence.

MEDICAL GROUP:

Ability to satisfactorily complete the medical examination for this class. Must be able to perform the essential functions of this job either with or without reasonable accommodation(s).

Ability to perform strenuous physical tasks, i.e., lifting and moving heavy objects weighing 50 to 100 pounds.

Ability to distinguish basic colors for safety identification.

Candidates must have maximum uncorrected vision of 20/60 in each eye and corrected vision in each eye of at least 20/30.

CODE NO: 2650

WASHINGTON METROPOLITAN TRANSIT AUTHORITY
POSITION DESCRIPTION

ENGINEERING DATA ANALYST (TGV), TA-18
DEPT/OFFICE: TIES/CENI

DATE: 9/28/12

FLSA: NON-EXEMPT
ROLE: 03

REVIEWED:
TIES: ~~[illegible]~~ 10/3/2012
HRSD: ~~[illegible]~~ 9/28/12
LABR: ~~[illegible]~~ 9.28.12

REPORTS TO: Manager, Engineering Data Analysis

SUMMARY:

This position performs senior level analytical and engineering work. The incumbent obtains and analyzes detailed track geometry measurements of mainline tracks and tunnels using the Track Geometry Vehicle. The incumbent calibrates and validates computer software systems on board the Track Geometry Car that monitor the health of track geometry and construction such as rail wear, platform height and other conditions on the main line and yards. This position is responsible for troubleshooting the computer software for real time monitoring capabilities. The incumbent collects data and analyzes the defects found, as per standards, to provide detailed reports for the field maintenance group to initiate corrective action. The incumbent creates and analyzes various reports. The incumbent creates and maintains database of defects and reviews quality and accuracy of measurements. This position is also responsible for assessing and evaluating historical runs from off board software, to determine if new defects are found or if open defects have been successfully repaired.

MAJOR DUTIES:

Sets up TGV measurement and monitoring software systems at the beginning, during and after each run in the field.

Monitors and determines – in real time - exceptions whether quantitative or qualitative. This includes conditions in the field which may be deemed unsafe where no known standard or protocol exists, as in the case of hotspots.

Works to devise a set of standards and protocols for treatment of field conditions

detected by one or more of the TGV on-board capabilities where no standard currently exists in concert with others.

Assesses Track Construction and geometry standards to conditions in field on the mainline and yards that the TGV software determines defect severity and applies standard (black, red, yellow, green).

Evaluates TGV outputs with respect to accuracy and deterioration trends using other third party measurement data. Calibrates software working with WMATA staff and/or ENSCO staff.

Queries Optram and communicates with office analytical engineering staff to compare detected defects with historical open work orders as necessary.

Reviews historical data from Optram to determine the history of a particular location both before and after work is scheduled.

Loads car borne or office borne over-run data to compare deterioration to track components or geometry over time.

Accepts track geometry for new work locations before track is placed back into revenue service based on track geometry acceptable in accordance with Track Construction and Track Maintenance Standards.

Queries exception software based on a request from the Office or Chief Engineer staff and/or TRST managers.

Backs up data runs after each night and transmits data outputs to office staff at the end of each run.

The above duties and responsibilities are not intended to limit specific duties and responsibilities of any particular position. It is not intended to limit in any way the right of supervisors to assign, direct and control the work of employees under their supervision.

KNOWLEDGE, SKILLS AND ABILITIES:

Demonstrated knowledge of and hands-on experience in:

Track Geometry Vehicles or track measuring systems such as track geometry survey, flangeway, rail wear, tunnel crosscuts, and/or ultrasonic analysis and verification techniques.

Track construction, track maintenance, defect repair, track inspection and operations.

Track geometry, track components and special work/interlocking/turnouts.

High definition and infrared cameras.

Non-contact laser equipment and measurements techniques.

Learn and utilize all proprietary systems of the Rail Geometry Car including Track Geometry, Ultrasonic Rail Flaw Detection, Rail Wear Measurement, Guardrail Gap, Flangeway Gap, Third Rail Measurement, High Definition and Infrared Cameras.

Proficiency in data analysis and statistical reporting using Excel, Word and database applications. Knowledge of Computer Hardware.

Accurate and timely status reporting (written and verbal).

Work well as a Team player is critical. Ability to work in close quarters on a moving vehicle with multiple crew members and personalities.

Communicate at all levels of the organization as well as with the equipment supplier.

Deliver accurate and timely status reports (both orally and in writing). Ability to produce coherent analytical reports.

Work all shifts as necessary including nights, weekends, days, and unscheduled overtime. Ability and willingness to make a multi-year commitment to the Track Geometry Vehicle Team.

MINIMUM QUALIFICATIONS:

Graduation from an accredited college or university with a Bachelor's Degree in Computer Science, Data Communications, Telecommunications, Civil Engineering, Mechanical Engineering, Electrical Engineering or related field. Minimum four (4) years of experience in computerized data, business, or scientific analysis. Experience with database management software and reports. Experience working in a large-scale public or private sector transportation and/or transit organization is preferred.

Or an equivalent combination of post high school education and minimum eight (8) years relevant work experience in computerized data, business, or scientific analysis. Experience with database management software and reports. Experience working in a large-scale public or private sector transportation and/or transit organization is

preferred.

LICENSE:

Possession of a valid motor vehicle operator`s license issued from jurisdiction of residence and ability to legally operate a motor vehicle in Maryland, DC and Virginia.

MEDICAL GROUP:

Ability to satisfactorily complete the medical examination for this position. The incumbent must be able to perform the essential functions of this position either with or without reasonable accommodations.

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
POSITION DESCRIPTION

Job Title:	**Manager Track Geometry Vehicle Operations**			**Job Code:**	**6782**
Department:	**CENI/TSFA**	**Grade:**	**LS-12**	**FLSA:**	**Exempt**
Represented ☐		**Non-Represented** ☑			

Approval Signatures	Date
HRTA	8/31/16
DEPT	6 SEP 16
LABR	9/8/16
HRCB	9.8.16

REPORTS TO: Assistant Chief Engineer- Track, Civil, ROW

SUMMARY

This is professional, supervisory, technical, and administrative Track inspection work of a complex nature. The Manager Track Geometry Vehicle (TGV) is responsible for coordinating, scheduling and supervising program activities and assigned staff associated with automated, mainline and yard track inspections performed using Track Geometry Vehicle (TGV). Tracks are located in tunnels, on aerial structures, and at grade. Responsibilities include inspections involving primarily track and fixed facility geometry, ultra-sonic (UT) testing by automated and hand-held devices, videography and thermal imaging. Supervises TGV activities including but not limited to: scheduling operator training, measurement operations, report generation, calibration and performance evaluation; participates in special track inspections and maintenance related projects; review presentation and coordination of test results with other WMATA offices; collaboration and interaction with track maintenance, vehicle maintenance, vehicle engineering and contracted forces.

ESSENTIAL FUNCTIONS

- Plans, develops, manages and implements policies and procedures within the TGV operation. Establishes, analyzes, and evaluates branch programs, goals, and objectives as they pertain to track, way maintenance functions, and operational requirements.

- Plans, coordinates, schedules and implements all Track Geometry Vehicle activities, operations and tasks with those of other departments and outside agencies and organizations, consistent with WMATA revenue schedules.

- Coordinates assigned TGV activities between various departments to ensure that necessary material and equipment are requisitioned and support is provided.

- Monitors and serves as Technical Representative of the Contracting Officer on contracts pertaining to TGV equipment servicing and support as well as track and way projects.

- Maintains contemporary Record Log of TGV operations, staff actions, maintenance, and calibration activities. Monitors TGV performance and schedules internal and external servicing and calibrations, and routine maintenance.

- Coordinates and participates in preparation and review of computer graphic and text based reports of TGV operations. Distributes and safeguards inspection data.

OTHER FUNCTIONS

- Maintains knowledge of recent developments in transit track and way, structure and inspection management operations, and system maintenance activities. Evaluates, recommends and assists in implementation of those which are seen as beneficial to the achievement of department goals and objectives.

- Evaluate and recommend acceptance of offers from vendors and contractors in accordance with the Authority's procurement manual.

- Attends office and department committee meetings to make presentations regarding contractual needs, when required.

- Coordinates the preparation of technical specifications for geometry vehicle and measurement technology.

- Conducts periodic staff meetings with division staff to ensure efficient operations. Supervise, develop and coordinate an effective track way and systems maintenance inspection function for the Authority's track related properties. Supports work programs of TRST regions.

- Participates in evaluation of track and structures work to be accepted for subsequent phase operations, and of new equipment to be acquired for the track maintenance and inspection activities.

- Implements procedures for undertaking corrective measures in emergency situations without interruption or delay to normal train operations service when feasible.

- Ensures proper and timely notification is provided to central control operations when undertaking work assignments.

- Assists in the preparation of budgetary forecasts and insures personnel are properly trained and follow established safety guidelines.

- Attends meetings, hearings and high-level planning sessions, inside and outside the Authority pertinent to the execution of the functional responsibilities of Track Engineering.

- Periodically represents the Authority at similar national and local conferences. May visit other transit properties to observe and possibly incorporate best practices to operate a more efficient and safe railroad.

The essential duties listed are not intended to limit specific duties and responsibilities of any particular position. Nor is it intended to limit in any way the right of managers and supervisors to assign, direct and control the work of employees under their supervision.

BUDGETARY RESPONSIBILITY

This job does not have budgetary responsibilities			☐
This job has responsible for authorizing payments, purchases, check requests, reconciling the ledger for the department or other such activities.			☐
This job has direct responsibility for project or department budgets.			☑
This job's budgetary responsibility pertains to:		The range that best describes the overall dollar amount for which this job has budgetary authority is:	
A Single Project	☑	Less than $500,000	☐
Multiple Projects	☐	Between $500,000 and $1M	☐
A Single Department	☐	Between $1M and $5M	☑
Multiple Departments	☐	Greater than $5M	☐

SUPERVISION

Supervisory Responsibilities: NOTE: This refers to supervision of other WMATA employees. Check only one box.	
☐	Not responsible for supervising others.
☐	Guides work of others who perform essentially the same work. May organize, set priorities, schedule and review work, but has no responsibility to hire, terminate, review performance or make pay decisions.
☐	Supervises work of others, including planning, assigning and scheduling work, reviewing work and ensuring quality standards, training staff and overseeing their productivity. May offer recommendations for hiring, termination and pay adjustments, but does not have responsibility for making these decisions.
☑	Supervises work of others, including planning, assigning, scheduling and reviewing work, ensuring quality standards. Is responsible for hiring, terminating, training and developing, reviewing performance and administering corrective action for staff. Plans organizational structure and job content.

KNOWLEDGE Thorough knowledge of how a rapid rail transit system is regulated; a working knowledge of current track and structures maintenance, as well as inspection and systems maintenance procedures, to include emergency operations; and a working knowledge of the principles of failure modes of infrastructure components.

- Extensive knowledge of WMATA's and Federal DOT Standards and all applicable Federal, State and local codes governing Track Maintenance.

- Comprehensive knowledge of the Authority's rules and regulations; rapid rail transit maintenance engineering plans; and procedures and Collective Bargaining Agreements.

SKILLS

- Must have mechanical systems aptitude
- Skilled in performance of Surveying/Track Geometry work
- Skilled in the performance of ulstrasonic testing
- Demonstrated radio communication skills

ABILITIES Ability to lead, manage and train all the diverse Track TGV inspection personnel and functions in compliance with applicable Authority human resources and labor relations policies, procedures, regulations and agreements.

- Ability to maintain current knowledge and understanding of the state-of-the-art rapid rail activities and to contribute to the solution of select technical problems.
- Ability to communicate effectively (verbal and written), and use Maximo, OPTRAM and other computer based asset management system(s).

MACHINES, TOOLS, EQUIPMENT, SOFTWARE, AND HARDWARE REQUIRED:

- Spreadsheet and database software (Microsoft products, MAXIMO, OPTRAM, GEOEDIT)
- Video, laser, and thermal imaging devices and systems

MINIMUM QUALIFICATIONS

Education

- Graduation from an accredited college or university with a Bachelor's Degree in Electrical, Mechanical, Civil engineering field.
- In lieu of a Bachelor's Degree, will consider 4 years of progressively responsible experience in rapid rail transit organization engaged in track maintenance and engineering, inspections, and vehicles with knowledge of the application of state-of-the-art track inspection systems and test equipment, in addition to the below experience requirements.

Experience

- A minimum of eight (8) years progressively responsible experience in rapid rail transit organization engaged in track maintenance and engineering, inspections and vehicles with knowledge of the application of state-of-the-art track inspection equipment.

- Experience in track engineering, test vehicle operations, and performance of various testing equipment and functions of the TGV.

- Knowledgeable and/or certified in Ultra-Sonic Testing, and experience with database and spreadsheet software.

Certification/Licensure

- Certified in Ultrasonic, and/or Thermographic testing

Preferred Supervisory experience

- Surveying experience

PHYSICAL REQUIREMENTS and WORKING CONDITIONS

Physical Requirements and Working Conditions

PRIMARY WORK LOCATION: (Please check only ONE box)			
Office Environment	☑	Vehicle	☐
Warehouse	☐	Train	☐
Close quarters	☐	Outdoors	☐

VISUAL ACUITY: Includes the color, depth perception, and field of vision. (Please check only ONE box)	
Required to have close visual acuity to perform an activity such as: preparing and analyzing data and figures; transcribing; viewing a computer terminal; extensive reading; visual inspection involving small defects, small parts, and/or operation of machines; using measurement devices; and/or assembly or fabrication of parts at distances close to the eyes.	☑
Required to have visual acuity to perform an activity such as: operating machines such as lathes, drill presses, power saws and mills where the seeing job is at or within an arm's reach; performing mechanical or skilled trades tasks of a non-repetitive nature such as ones by carpenters, technicians, service people, plumbers, painters and mechanics.	☐
Required to have visual acuity to operate motor vehicles or heavy equipment.	☐
Required to have visual acuity to determine the accuracy, neatness, and thoroughness of the work assigned (e.g. custodial, food services, general labor, etc.) or to make general observations of facilities or structures (e.g. security guard, inspector, etc.)	☐

OVERALL PHYSICAL STRENGTH DEMANDS: The overall physical requirements of the job. (Please check only ONE box)				
Sedentary Exerting up to 10 lbs. occasionally or negligible weights frequently; sitting most of the time.	**Light** Exerting up to 20 lbs. occasionally, 10 lbs. frequently, or negligible amounts constantly OR requires walking or standing to a significant degree.	**Medium** Exerting 20-50 lbs. occasionally, 10-25 lbs. frequently, or up to 10 lbs. constantly.	**Heavy** Exerting 50-100 lbs. occasionally, 10-25 lbs. frequently, or up to 10-20 lbs. constantly.	**Very Heavy** Exerting over 100 lbs. occasionally, 50-100 lbs. frequently, or up to 20-50 lbs. constantly.
☐	☐	☑	☐	☐

PHYSICAL ACTIVITY : The physical activity of the job (Indicate frequency for all that apply)				
C **Continuously** Two-thirds (2/3) or more of the time.	F **Frequently** From one-third (1/3) to two-thirds (2/3) of the time.	O **Occasionally** Up to one-third (1/3) of the time.	R **Rarely** Less than one (1) hour per week.	N **Never** Never occurs.

Physical Activity	Frequency	Description
Standing	F	Remaining upright on the feet, particularly for sustained periods of time.
Sitting	O	A continuous period of being seated, especially when engaged in a particular activity.
Walking	O	Moving about on foot to accomplish tasks, particularly for long distances or moving from one work site to another.
Lifting	R	Raising objects from a lower to a higher position or moving objects horizontally from position to position. Requires the substantial use of the upper extremities and back muscles.
Stooping	O	Bending body downward and forward by bending the spine at the waist.
Pushing/Pulling	R	Using upper extremities to press against something with steady force to thrust forward, downward or outward OR to draw, drag, haul or tug objects in a sustained motion.
Reaching	R	Extending hand(s) and arm(s) in any direction.
Repetitive Motions	R	Making substantial movements (motions) of the wrists, hands, and/or fingers.
Fine Dexterity	R	Picking, pinching, typing or otherwise working, primarily with fingers rather than with whole hand or arm as in handling.
Kneeling	R	Bending legs at knee to come to a rest on knee or knees.
Crouching	O	Bending the body downward and forward by bending leg and spine.
Crawling	R	Moving about on hands and knees or hands and feet.
Grasping	O	Applying pressure to an object with fingers and palm.
Balancing	O	Maintaining body equilibrium to prevent falling when walking, standing or crouching on narrow, slippery or moving surfaces.
Hearing	C	Perceiving the nature of sounds at normal speaking levels and having the ability to receive detailed information through oral communication, and making fine discriminations in sound.
Talking	C	Expressing or exchanging ideas by means of the spoken word; those activities where detailed or important spoken instructions must be conveyed to other workers accurately, loudly, or quickly.
Climbing	O	Ascending or descending ladders, stairs, scaffolding, ramps, poles and the like, using feet and legs and/or hands and arms. Body agility is emphasized.
Feeling	O	Perceiving attributes of objects, such as size, shape, temperature or texture by touching with skin, particularly that of fingertips.

NON-PHYSICAL ACTIVITY: (Indicate frequency for all that apply)				
C **Continuously** Two-thirds (2/3) or more of the time.	**F** **Frequently** From one-third (1/3) to two-thirds (2/3) of the time.	**O** **Occasionally** Up to one-third (1/3) of the time.	**R** **Rarely** Less than one (1) hour per week.	**N** **Never** Never occurs.

Description of Non-Physical Activities	Frequency
Time pressure	C
Emergency situation(s)	O
Frequent change of tasks	O
Irregular work schedule / overtime	O
Performing multiple tasks simultaneously	F
Working closely with others as part of a team	C
Tedious or exacting work	R
Noisy / Distracting work environment	F
Other (Specify)	

ENVIRONMENTAL FACTORS: The conditions the incumbent will be subject to in the job. (Indicate frequency for all that apply)				
C **Continuously** Two-thirds (2/3) or more of the time.	**F** **Frequently** From one-third (1/3) to two-thirds (2/3) of the time.	**O** **Occasionally** Up to one-third (1/3) if the time.	**R** **Rarely** Less than one (1) hour per week.	**N** **Never** Never occurs.

Description of Environmental Factors	Frequency
Mechanical Hazards	F
Chemical Hazards	R
Electrical Hazards	C
Fire Hazards	R
Respiratory Hazards	R
Extreme Temperatures	R
Noise/Vibration	F
Wetness/Humidity	F
Exposure to infectious diseases	N

MEDICAL GROUP: (Only check if a medical exam is required for the job)	
Satisfactorily complete the medical examination for this job, if required. Incumbent must be able to perform the essential functions of the job with or without reasonable accommodation(s).	☐

PROTECTIVE EQUIPMENT REQUIRED: (Please list)

Standard PPE for Right of Way Access

Employee Signature		
Name (Printed)	**Signature**	**Date**

CODE NO: 5569

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
POSITION DESCRIPTION

SUPERVISOR, TRACK INSPECTION, LS-08
DEPT/OFFICE: TIES/TRST

DATE: 3-13-13

FLSA: NON-EXEMPT
ROLE: 03

REVIEWED:
TIES: ~~ABS~~ 3/21/2013
HRCB: ~~ZHall~~ 3/13/13
LABR: ~~BSNR~~ 3.11.13

REPORTS TO: Assistant Superintendent

SUMMARY:

This position is responsible for supervising track inspection crews in the office of Track and Structures throughout the Authority's track and way system. Incumbent has latitude for independent judgment and performing appropriate action within the established guidelines and is supervised by Track and Structures Assistant Superintendent.

MAJOR DUTIES:

Performs inspection activities of track construction, replacement of rails, special track work parts, ties, direct fixation fasteners, rail joints, cleaning of roadbed, track lining/surfacing operations, and welding, etc.

Ensures track inspection personnel are trained in the proper use and operation of all equipment; provides on-the-job training to subordinate personnel.

Maintains records and reports of work deficiencies, procurement, usage of materials, and verify daily time reports of employees.

Ensures safety requirements and WMATA rules and regulations are followed while performing inspection activities.

Plans methods and schedules inspection activities. Ensures appropriate inspection equipment is available, utilized correctly assuring proper inspections are done.

Ensures equipment is maintained and sent for PMI as required.

Performs the duties of the Roadway Worker in Charge (RWIC) to provide a safe Roadway work environment for crews and/or contractors.

Subject to 24-hour call-in for emergency or unusual conditions.

Operate WMATA non-revenue vehicles.

The above duties and responsibilities are not intended to limit specific duties and responsibilities of any particular position. It is not intended to limit in any way the right of supervisors to assign, direct and control the work of employees under their supervision.

KNOWLEDGE, SKILLS AND ABILITIES:

Must have knowledge of Federal Railroad Administration (FRA) regulations and standards.

Must have knowledge of corrective actions associated with continuous welded rail (CWR).

Ability to acquire the knowledge of track work design, address the problems encountered on ballasted, direct fixation, aerial structures, and concrete tie track structures.

Knowledge of track inspection standards and ability to ensure personnel are aware of standards, tolerances, typical adverse conditions that may affect movement and behavior of track.

Must comply with WMATA license policy for operation of WMATA non-revenue vehicles. Must maintain license as a condition of continued employment.

Must have analytical skills to solve highly complex mechanical, electrical, and technical problems.

Ability to demonstrate effective communication and interpersonal skills including the ability to communicate by radio and other electronic means.

Proficient using PC and software applications.

Knowledge of corrective actions associated with continuous welded rail (CWR) and the knowledge of rail distressing procedures. Ability to acquire the knowledge of track work designs, and the problems encountered on ballasted, direct fixation, aerial structures, and concrete tie track surfaces. A comprehensive knowledge of the safety rules and the rules governing protection of subordinates under FRA guideline Part 213, WMATA Metrorail Safety Rules and Procedures Handbook (MRSPH) and other applicable rules.

Acquired knowledge of the use/operations of track maintenance equipment.

Knowledge of or the ability to rapidly attain knowledge of the WMATA operating system and the Authority's rail operation and maintenance procedures.

Ability to supervise and train personnel in track inspection.

Ability and willingness to work variable shifts, i.e. evenings, midnights, weekends, holidays.

Ability to perform required work assignments in and during inclement weather conditions.

Ability to complete required reports, both written and electronic format.

Ability to distinguish specific colors.

Ability to communicate effectively both written and orally.

Ability to deal tactfully and effectively with associated personnel.

Ability to pass comprehensive pre-employment drug and alcohol screening.

Ability to maintain status as a "Safety Sensitive" employee subject to random drug and alcohol screening.

Ability to work in an environment where there is exposure to dust, noise, or temperature. May be exposed to unpleasant working conditions to include dust, noise, temperature, weather, petroleum products, and chemicals while visiting WMATA's operating facilities, assuming incumbent is observing all policies and procedures, safety precautions and regulations, and using all protective clothing and devices provided.

Physical capability to frequently spend 50% to 70% of time in the field , exert moderate physical effort while standing, walking, or lifting materials/tools/objects weighing up to 100 pounds.

MINIMUM QUALIFICATIONS:

Graduation from an accredited college or university with an Associate's Degree in Business Administration, or certification from an approved technical program, Track Management/Engineering, Construction Management, Mechanical, or related field.
Or a high school diploma or GED with five (5) years experience in track maintenance and repairs on a Class I railroad or on an electrified rail transit system.

Incumbents subject to the federal testing regulations of safety sensitive positions, which include random alcohol and drug testing as a condition of continued employment.

Incumbents are required to maintain qualification for access to Roadway as a condition of continued employment.

Incumbents required to maintain qualification for access to Roadway Worker Protection Level IV certification as condition of continued employment.

LICENSE:

Possess a valid motor vehicle operator's license from jurisdiction of residence.

MEDICAL GROUP:

Ability to satisfactorily complete the medical examination for this position. The incumbent must be able to perform the essential functions of this position either with or without reasonable accommodations.

CODE NO: 0731

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
POSITION DESCRIPTION

SENIOR SOFTWARE SUPPORT ANALYST, TA-23
DEPT/OFFICE: TIES/TRST

DATE: 8-20-13

FLSA: EXEMPT
ROLE: 03

REVIEWED:
TIES: ~~[illegible]~~ 8/20/2013
HRCB: [illegible] 8/20/13
LABR: ~~[illegible]~~ LZ 8.13.13

REPORTS TO: Assistant General Superintendent,TRST

SUMMARY:

This is a senior level professional computer application support and analysis position involving data management and evaluation, requirement analysis, and implementation of real-time information and reporting systems. The incumbent in this position performs advanced technical work in the development, maintenance, and support of the database applications in various platforms. The incumbent must have proficiency in database management theory and Structured Query Language to implement effective risk and cost control and monitoring of capital improvement and reimbursable projects. The incumbent will also serve as the lead facilitator in complex technical environments and will be required to manage critical control applications and information systems. This position has considerable latitude for independent judgment and action within broadly stated guidelines.

MAJOR DUTIES:

Acquires data and develops tools to facilitate all aspects of track maintenance planning such as track geometry vehicle (TGV) data, third party track inspection data systems, Maximo defect data and track production data.

Formulates statistical data to device tracking systems for maintenance planning performance. Employs software development techniques and 4th Generation languages and report generators to develop applications.

Updates and maintains Asset Management Database Optram used as the foundation for Track Maintenance Planning.

Reviews, analyzes, and interprets operational information requirements, administers program to address system requirements, and implements solutions to accomplish data resource needs. Determines and recommends improvements to hardware and software systems to enhance program management information system.

Provides programming expertise in the languages of Visual DBase and Delphi to generate custom office applications and to develop interactive information support for management decision-making.

Manages program plans, budget activities, and labor job numbers.

Creates and modifies Maximo and Optram queries to retrieve information, produce reports and conduct analyses. Integrates data acquisition with Ad Hoc Microsoft applications for use in planning, trend analysis, strategy formulation, and information tracking and reporting.

Creates Track Maintenance Progress Reports and managerial tools to facilitate program management tasks.

Conducts reviews and evaluates whether proper information dissemination and procedural controls have been observed. Verifies accuracy and integrity of project information and input and output of applications. Develops and amends written procedures to facilitate management objectives.

Serves as liaison between project managers, IT, TRST, and other Authority offices in matters and activities related to database information management for effective project management and tool development.

The above duties and responsibilities are not intended to limit specific duties and responsibilities of any particular position. It is not intended to limit in any way the right of supervisors to assign, direct and control the work of employees under their supervision.

KNOWLEDGE, SKILLS AND ABILITIES:

Utilize cost and schedule controls including data base management principles to manage cost and schedule aspects of high dollar value, multi contract track maintenance program.

Analyze track maintenance impact through simulations. Analyze quantitative data and to demonstrate analytical skills. ability to effectively coordinate administrative requirements and to develop strategic and management

applications. Experience in problem solving, process improvement methods, and increase productivity and business responsiveness.

Database Management theory, Structured Query Language, PeopleSoft, Maximo query design, 4th Generation languages and report generators to develop applications. Customize and tailor ad hoc Microsoft office applications to produce information solutions.

Maximo modules such as Query Manager, work order, project labor and crystal reports.

Track Maintenance techniques, the Authority's program rules and procurement regulations that impact the Authority and its transit operations. Independently organize and carry out assignments with minimum direction.

Functions of the Maximo system related to implementation of data analysis, report design, integrated program control methods, and reconciliation of various modules used at WMATA.

Project scope, cost and schedule control in the capital improvement environment and implement mechanisms using the data acquired from the PeopleSoft, Maximo, and Optram Systems.

Analyze, evaluate, and interpret the life-cycle costing and maintenance data of transit mechanical, structural, and electrical systems.

Analyze and present findings on various assignments/subjects and to justify, defend and support proposals before project stakeholders and external consultants and contractors.

Establish and maintain effective working relationships with individuals and organizations with which interface is required and skill in interpersonal communications to effectively interpret management requirements and provide clear, concise solutions as well as written documentation and user instructions.

MINIMUM QUALIFICATIONS:

Graduation from an accredited college or university with a Bachelor's Degree in Computer Science, Mathematics, Engineering or related fields. A minimum of six (6) years of progressively responsible experience in design information processing, program development, analysis and implementation experience in a large public or private organization.

Or, an equivalent combination of post high school education and minimum ten (10) years of progressively responsible experience in design information processing, program development, analysis and implementation experience in a large public or private organization.

MEDICAL GROUP:

Ability to satisfactorily complete the medical examination for this job. The employee must be able to perform the essential functions of this job either with or without reasonable accommodations.

9.2 REFERENCE 2: TRACK INSPECTION SHEETS

Washington Metropolitan Area Transit Authority
Maintenance and Material Management System
TRST Track Walker Report - 02/15/2017

Total WO : 0 **Line: C** **Track: 2** **Start Marker: 0337+38** **End Marker: 0622+88** **Priority: ALL**
Defect Code: ALL **Component Codes: ALL** **Office: ALL** **Components: ALL**

WO# Status	Chain Marker From	Chain Marker To	Qty.	Linear Footage	Asset Number Location	Component	Defect	Pri.	Remarks

Inspection Completed per WMATA 1000 Standards? [X] Yes [ ] No If No Why? _____

Notes: Personel performed Safety Briefing, Performed Track Inspection from C09-C10, C-12-C15 with visiual inspection of Swithes from C-10 / C-14 up to the Diamond on Track 2
No new Defects found
all egress exits clear

Track Walker: [redacted] Print [redacted] Sign Date: 2-15-17

Flag Person: [redacted] Print [redacted] Sign Date: 2-15-17

Track Inspection Supervisor: [redacted] Print [redacted] Sign Date: 2/15/2017

DAILY TRACK INSPECTION REPORT

Name [redacted] Date 2-15-17 Page 1

Inspected From C09/C10 To C12/C15 LINE C Track 2

Item	Exception Chain Marker No. From	To	Track No.	Rail L/R/B	Switch No.	Codes Comp.	Defect	Status G/Y/R	MaximoW.O #
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									
11.									
12.									
13.									
14.									
15.									
16.									
17.									
18.									

COMMENTS

1.	No Defects Found
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	

[redacted]

Track Inspector Signature

Supervisory Signature/ Date

MONTHLY SWITCH INSPECTION FORM

TRACK IDENTIFICATION: [redacted] **DATE:** 12-20-16

SWITCH NUMBER: 1A **FROG SIZE:** 8G (LH) RH EQUAL

[redacted]
INSPECTOR(S)

[redacted]
INSPECTOR(S)

[redacted]
WATCHMAN

MAXIMO NUMBER: [redacted]

GENERAL

FLANGEWAYS CLEAR:		YES ✓	NO				**NOTES:**	
CRIB AREAS CLEAR:		YES ✓	NO				**NOTES:**	
SURFACE:	GOOD ✓	FAIR		POOR			**NOTES:**	
ALIGNMENT:	GOOD ✓	FAIR		POOR			**NOTES:**	

TIES/FASTENERS

NUMBER OF DEFECTIVE: 3

Instulated Joints: **Suspended** Y ✓ N

SWITCH

		GAUGE	CROSS LEVEL			NOTES:
Measurement 6" ahead of points:		56 1/4	1/4			
Switch point LOWER than stock rail?	RIGHT: ✓	NOTES:		LEFT:		NOTES:
Switch Rods:	OK ✓	Bent		Damage		Loose
Switch Clips:	OK ✓	Bent		Damage		Loose

		GAUGE	CROSS LEVEL		GAUGE	CROSS LEVEL
Heel Block:	Straight Side	56 1/2	0	Turnout Side	56 1/2	1/4

CLOSURE RAILS

		GAUGE	CROSS LEVEL		GAUGE	CROSS LEVEL
IJ Measurement:	Straight Side	56 3/8	1/4	Turnout Side	56 1/2	1/4

FROG

	OK	WORN	CHIPPED	BROKEN	NOTES:
Point:			✓		
Top Surface:	✓				
Bolts:	✓				
Wing Rails:	✓				
Guard Face Gauge:	✓				

		GAUGE	CROSS LEVEL		GAUGE	CROSS LEVEL
Gauge / Cross Level at TOE:	Straight Side	56 1/2	1/4	Turnout Side	56 3/8	0
Gauge / Cross Level at POINT:	Straight Side	56 1/2	5/8	Turnout Side	56 7/16	0
Gauge / Cross Level at HEEL:	Straight Side	56 1/2	5/8	Turnout Side	56 1/2	1/8
		GAUGE	**CROSS LEVEL**		**GAUGE**	**CROSS LEVEL**
Flangeway Width Measurement:	Straight Side	1 7/8		Turnout Side	1 7/8	
Flangeway Depth Measurement:	Straight Side	2		Turnout Side	2	

GUARD RAILS

Condition: **UNSECURED** ____ **RIGHT** OK ✓ DAMAGED ____ **LEFT** OK ____ DAMAGED ____

		GAUGE	CROSS LEVEL		GAUGE	CROSS LEVEL
Flangeway Width Measurement:	Straight Side	1 7/8		Turnout Side	1 7/8	

Lubrication: OK ✓ NEEDED ____ APPLIED ____

NOTES

Hand thrown switch Good: y / n 8 Missing shave clip frog area, minor chipped frog point. 7 Missing shave clip Frog Tie area. 1 Cover board Missing End Approach. Left hand Stock Rail head check.

Between 1A to Diamond ⇒ 56 13/16. 3 decayed Ties.

[redacted] Inspector Date:

[redacted] Inspector Date: 12-20-16

[redacted] Watchman Date: 12-20-16

[redacted] Supervisor Date: 12/20/16

Signature(s)

PRIORITY CODE (highlight one)

GREEN	YELLOW	RED	BLACK

(ADD YOUR) REGION

Washington Metropolitan Area Transit Authority

METRORAIL SAFETY RULES AND PROCEDURES HANDBOOK

PERMANENT ORDER

NO. T-16-07 Introduction of 10 MPH Speed Restriction on Tracks where Workers are Present

Date: Friday, June 24, 2016

TO: All Personnel

Permanent Order T-16-07 introduces a **10 MPH** Speed Restriction on tracks where personnel are present.

Additions to rules and procedures are shown in bold and underline text; deletions are struck-through.

MSRPH Operating Rule 3.87:

3.87 Rail vehicle operators shall maintain a constant lookout in the direction in which their vehicles are moving. When rail operators observe persons on the roadway, they shall:

a. Sound mainline horn **(2 Long Sounds)** to warn those people of the vehicle's approach. If personnel do not physically clear the roadway and appropriate acknowledgement of the horn signal is not received, the vehicle shall be brought to an immediate stop and the train operator shall contact the Rail Operations Control Center (ROCC) and await their instructions before moving the train. Train Operators shall report all near misses to ROCC.

Notice: Opposite Track Trains: Clearing of the track ~~This rule~~ shall not apply to gang(s) ~~with designated watchman/lookouts working~~ on the opposite track. ~~The watchman/lookout~~ Roadway workers shall acknowledge the approaching train by facing the train and giving/ displaying the ~~proper~~ proceed/clear signal. The Train Operator shall acknowledge with two **short** horn blasts **and be prepared to stop if conditions warrant it**. ~~The gang shall not have to clear the tracks.~~

b. Upon receiving the appropriate proceed/clear signal from the watchman/lookout on the roadway, and verifying that all personnel and equipment are clear of the roadway, the Train Operator shall:
   - acknowledge the proceed/clear signal with 2 **short** mainline horn blasts (individuals on the roadway do not have to continually proceed trains after the Train Operator's acknowledgement);
   - stop and switch to Mode 2, Level 1 if not already in manual mode;
   - discontinue sounding train horn after acknowledgement, and;
   - continue at ~~35~~ **10** mph until clear of personnel ~~on either track~~.

MSRPH Operating Rule 3.164:

3.164 When flagging protection is observed on the roadway or by communication from ROCC, the Train Operator shall:

a. Reduce speed to not more than ~~35~~ **10** mph and be prepared to stop at roadway flag person or watchman/lookout signal;

b. Change to low beam headlights; and

c. Operate at no more than ~~35~~ **10** mph unless directed otherwise by the RWIC or ROCC.

MSRPH SOP #28 - PROTECTION FOR ROADWAY WORKERS AND ESTABLISHMENT OF THIRD RAIL POWER OUTAGES AND WORK AREAS ON THE ROADWAY:

28.5.12.1.1 Coordinate with ROCC, the application of a shunt strap on the work track in accordance with the established traffic direction. The shunt strap(s) shall be applied at a track location that will assure trains enter and travel a significant portion **of the work area at a speed not to exceed 10 mph**. At least one train on each track shall be allowed to operate through the affected area to observe that the desired speed has been achieved before work begins. The shunt strap must be verified by ROCC prior to the start of any wayside work and remain in place until the work is complete and all crew members have cleared to the safety walk or other known clearance area. The shunt strap shall not be placed or removed in front of a train that is visible on the affected track. ROCC shall coordinate train movement through the affected area.

Approval of Permanent Order T-16-07

Recommended:

[redacted]
Director, ROCC
Chair, Rail Rule Book Committee

Concur:

[redacted]
Managing Director
Office of Rail Transportation

Approve:

[redacted]
Assistant General Manager
RAIL

Concur:

[redacted]
Chief Safety Officer
Department of Safety &
Environmental Management

Washington Metropolitan Area Transit Authority

METRORAIL SAFETY RULES AND PROCEDURES HANDBOOK

PERMANENT ORDER

NO. T-16-04 Test Track Access and Use **Date:** Monday, March 21, 2016

TO: All Personnel

Permanent Order T-16-04 establishes a new Metrorail Safety Rules and Procedures Handbook (MSRPH) Standard Operating Procedure, **SOP #53 - TEST TRACK ACCESS AND USE**. This SOP establishes the procedures for the operation of the Test Track located between Greenbelt and College Park.

SOP #53 is attached.

SOP # 53 TEST TRACK ACCESS AND USE

53.1. PURPOSE

The purpose of this Standard Operating Procedure is to ensure a safe and standard sequence of operation while moving rail vehicles into and out of test track lead located on Track #2 just inbound of the E10/Greenbelt Interlocking, the operation of the test track and emergency operations.

53.2. SCOPE

This SOP is applicable to all WMATA Personnel and Contractors.

53.3. DEFINITIONS

53.3.1. Test Track: A track approximately 10,000 feet in length adjacent to the Green Line Track #2 between E09/College Park Station and E10/Greenbelt Station with third rail and a single crossover switch from Track #2 just inbound of the E10 Interlocking.

53.3.2. Test Track Switch: A single crossover switch located just inbound of the E10 interlocking between Track #2 and the test track. The single crossover consists of switch #5A on the test track and switch #5B on Track #2.

53.3.3. Test Track Controller: A WMATA employee located at the Test Track Control Room with supervisory control over the Test Track Automatic Train Control and Traction Power Systems.

53.3.4. Test Track Control Room: A control room adjacent to the test track similar to a WMATA Yard Tower with supervisory control capabilities over the test track

53.4. RESPONSIBILITIES

53.4.1. The ROCC Supervisor is responsible for supervising and coordinating the implementation of this SOP.

53.4.2. The ROCC Supervisor is responsible for ensuring the switch is properly aligned and with a lunar signal at E10-38 with crossover alinement to the test track.

53.4.3. All personnel, including ROCC Supervisors and field personnel, are responsible for clear radio communication that shall include the E10/Greenbelt Test Track Switch, confirming their position and lunar signal.

53.4.4. The Test Track Controller is responsible for reporting test track traction power breaker status information to ROCC.

53.5. PROCEDURES

Procedure #	Content
53.5.1	Procedure for entering mainline Track #2 adjacent to the Test Track
53.5.2	Preparation for train movement to and from the Test Track
53.5.3	Movement to the Test Track
53.5.4	Movement from the Test Track
53.5.4	Train movement on the Test Track

53.5.1. Procedure for entering mainline Track #2 adjacent to the Test Track

53.5.1.1. The entire area Track #2 and the test track from Chain Marker CM 656+80 thru CM 559+20 is a **No Clearance Area** that requires Foul Time to access the Roadway.

NOTE: Signs have been placed on the roadway informing personnel of this requirement.

53.5.2. Preparation for train movement to and from the Test Track

53.5.2.1. ROCC will confirm the traction power breaker status for the test track.

53.5.2.2. The ROCC will confirm that Normal traffic is established on Track #2 between E09/College Park and E10/Greenbelt.

53.5.3. Movement to the Test Track

53.5.3.1. ROCC will instruct the train to be routed to the test track to stop just outbound of either E10 signal 04 or 08 and await further instructions. The train will be routed to E10 signal 04 or 08 per typical mainline routing procedures.

53.5.3.2. ROCC will then set the route for a crossover move at E10-38.

53.5.3.3. ROCC will request either route E10 04-06 or E10 08-06 dependent upon the location Test Track bound train, in addition to an E10 38-32. Once the routes are displayed, ROCC will issue a permissive block to the test track bound train to clear E10-32 signal.

53.5.3.4. After ROCC has confirmed the test train is clear of E10-32 signal a straight through move will be set at E10-38 -36. ROCC will instruct the train on the test track to move under the instructions of the Test Track Controller on Start-up OPS #1 or 2. ROCC may then resume normal mainline operations.

NOTE: Once the test train has cleared E10-32 signal ROCC must place a normal call on switch #5

53.5.4. Movement from the Test Track

53.5.4.1. The Test Track Controller will instruct the train on the test track to stop just inbound of signal E10-32 and to contact ROCC for further instructions.

53.5.4.2. ROCC will request either route 06-04 or 06-08 at E10 dependent on the desired route for the train on test track back to E99/Greenbelt Yard. Once the route is displayed, ROCC will set at route from E10-32-38 for a crossover move.

53.5.4.3. Once ROCC has confirmed the train has cleared test track switch, ROCC will then set a route from E10-38-36 for a normal straight through move.

53.5.4.4. After ROCC has confirmed normal position of the test track switch #5 and a lunar at E10-38 normal mainline operations may resume.

NOTE: Once the test train has cleared E10-38 signal ROCC must place a normal call on switch #5

53.5.5. Train movement on the Test Track

53.5.5.1. The Test Track Controller will direct all train movements on the Test Track. The radio frequency that will be used to control movement of the trains on the test track is Start-Up OPS #1 or 2.

53.5.5.2. The Test Track Controller has supervisory control and status indications of the test track traction power breakers from the Test Track Control Room. Any abnormal conditions must be reported to ROCC/MOC.

53.5.5.3. Any emergency that may occur on the test track that requires third rail power to be removed from the test track will require the Test Track Controller to contact ROCC to have third rail power removed from the mainline tracks.

53.5.5.4. When an emergency occurs on the adjacent main line tracks requiring the removal of third rail power, ROCC must contact the Test Track Controller and request third rail power to be removed from the test track

NOTE: In the event of an emergency that requires immediate removal of third rail power on mainline ROCC will immediately remove third rail power from the test track and contact the Test Track Controller.

53.6. REFERENCES

SOP 1A

Approval of Permanent Order T-16-04

Recommended:
[redacted]
Acting Director Rail OCC, Chair
Rail Rule Book Committee

Concur:
[redacted]
Managing Director
Office of Rail Transportation

Approve:
[redacted]
Assistant General Manager, Transit
Infrastructure and Engineering Services

Concur:
[redacted]
Acting Chief Safety Officer
Department of Safety &
Environmental Management